G-Wiz HCX

USER MANUAL

Version 1.1

Limited Warranty and Disclaimer

G-Wiz Partners warrants the G-Wiz HCX flight computers to be free from defects in materials and workmanship and remain in working order for a period of 180 days. If the unit fails to operate as specified, the unit will be repaired or replaced at the discretion of G-Wiz Partners, providing the unit has not been damaged, modified, or serviced by anyone except for the manufacturer.

G-Wiz HCX flight computers are sold as an experimental accessory only. Due to the nature of experimental electronic devices, especially when used in experimental carriers such as rockets, the possibility of failure can never totally be removed. The owners, employees, vendors and contractors of G-Wiz Partners shall not be liable for any special, incidental, or consequential damage or expense directly or indirectly arising from the customer or anyone's use, misuse, or inability to use this device either separately or in combination with other equipment or for personal injury or loss or destruction of other property, for experiment failure, or for any other cause. It is up to the user, the experimenter, to use good judgment and safe design practices and to properly pre-test the device for its intended performance in the intended vehicle. It is the user or experimenter's responsibility to assure the vehicle will perform in a safe manner and that all reasonable precautions are exercised to prevent injury or damage to anyone or anything.

WARNING: Do not use this device unless you completely understand and agree with all the above statements and conditions. First time use of the G-Wiz HCX flight computer signifies the user's acceptance of these terms and conditions.

How to Contact G-Wiz Partners

Please see our web site at: http://www.gwiz-partners.com. There we have the latest versions of all our user manuals, device firmware, and FlightView software. We also have several options for you to contact us, including email and shipping address information.

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Important Safety Precautions

Use a checklist when you set up your flight computer and when you mount it in your rocket.

Dangers from ejection charges - Make safe the ejection charges, or disconnect the power whenever you transport the flight-prepped unit.

Electrostatic discharge - Static electricity may damage or destroy components on your flight computer. Keep it in an antistatic bag when not in use. Ground yourself before handling the flight computer. Be especially cautious when using it in low humidity environments.

Mount the flight computer in the correct orientation - Otherwise it will not operate properly. The "nose" end is indicated on the board. To confirm the orientation, make sure the terminal block is at the aft, or rear, end of the flight computer.

Make sure the flight computer is rigidly installed in the rocket payload bay.

Protect the flight computer from ejection gasses - Ejection gasses are corrosive and will damage the flight computer. Ejection gas damage will void your warranty.

Use good batteries - If you are using non-rechargeable batteries, we recommend using Duracell brand. Because many lower-cost batteries have press-fit contacts, vibration and sudden acceleration might cause them to come loose, resulting in a momentary or permanent break in your power connection. Losing power will cause a catastrophic flight failure.

Make sure your batteries are properly secured to prevent them from pulling wires out of the terminal block pins and always use good quality battery connectors.

If you hear the breakwire-launch error code, power the unit off before attaching the break wire.

Recommended Battery Sizes

	Minimum	Optimum	Maximum
CPU	7.5 volt	9 volt	12 volt
Pyro	7.5 volt	9 volt	15 volt

- Using too small a battery might cause a low-voltage failure and will reduce your operating time.
- Using too large a battery might damage the MOSFET switches with excessive current flow.

Table of Contents

Introduction 1
Components 2
Product Features 2
Using your Flight Computer 5
Your Flight Computer and Accessories 6
Setting Up your HCX for Flight 7
Testing the Setup 15
Mounting the Flight Computer in your Rocket 17
Reading Altitude Data after Recovering your Rocket 18
Using FlightView Software 20
Changing Your Preferences 20
Reading your Flight Data with FlightView 22
The Flight Data Window 24
Saving Flight Data to Your Computer 27
Connecting your G-Wiz HCX to your Personal Computer 28
Configuring your HCX 32
Bench Testing 36
Reading Sensor Statistics 38
Calibrating 39
Scaling Data from User-Provided Sensors 41
Appendix A 45
Appendix B 46
Appendix C 48
Appendix D 49
Appendix E 53
Appendix F 54
Appendix G 55
List of Procedures 57

Introduction

The G-Wiz HCX flight computer is a precision state-of-the-art accelerometer-based data-recording flight computer.

Using its dual sensors, altimeter and accelerometer, this flight computer can:

- Air-start clusters.
- Perform precision staging.
- Deploy a single chute at apogee.
- Deploy a drogue chute at apogee and a main chute at your preset altitude.

The processor at the heart of this third-generation flight computer is an integrated 12-bit A to D converter with an 8 MIPS CPU core.

The HCX flight computer uses proprietary firmware algorithms. These algorithms take full advantage of its dual sensor system to determine the key events in a rocket's flight, including:

- Launch.
- Booster burn-out.
- Sustainer ignition.
- Sustainer burn-out.
- Inertial and barometric apogee events.
- Altitude, both rising and falling.
- Landing.

HCX has four independent high-current output ports. Therefore it can simultaneously control four separate flight events including:

- Apogee deployment.
- Low altitude deployment.
- Starting of clustered motors.
- Midair ignition of upper stage motors.
- Activation of an event based on data from a user-provided sensor.

The HCX has three models which can measure up to 56, 112, or 224 G of positive/negative acceleration.

Our unique shunt is designed to prevent the pyro ports from accidentally firing while you are working on, or transporting, your rocket.

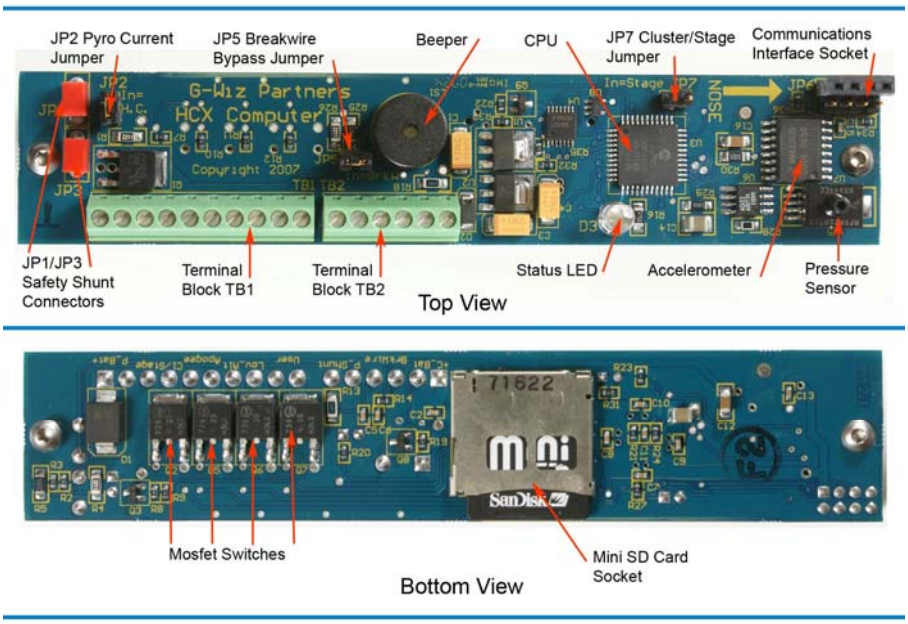
The on-board beeper starts to read out the peak altitude upon landing.

HCX keeps track of multiple flights by recording the accelerometer and barometric sensor data in a file on a Mini-SD card.

Our FlightView software, which runs on Windows, Mac OS X, and Linux platforms, reads the files from the Mini-SD card. This program analyzes your flight data, presents it in graphical format, and allows you to save the data to your personal computer.

Components

Here are the major components of the G-Wiz HCX flight computer. More detailed information on each of these components can be found in the ***Using your Flight Computer*** section.



Product Features

Hardware

- Accurately measures barometric altitude as high as 70,000 feet above mean sea level (MSL).
- The HCX flight computer comes in three models. This chart shows the model numbers and the maximum acceleration each model can measure.

Model Number	Maximum Acceleration
HCX/50	+/- 56 G
HCX/100	+/- 112 G
HCX/200	+/- 224 G

Firmware

- Configuration settings are stored on non-volatile EEPROM and stay in the flight computer until you change them.
- The HCX uses the US Standard Atmosphere Model to calculate altitude from the pressure sensor readings.
- The HCX uses filtering to take into account the chamber pressure oscillation inherent in hybrid motors.

Data Output

- The beeper and LED indicate configuration and operational status of the flight computer before the flight.
- The beeper and LED read out peak altitude after landing. You can configure the unit to also beep out the maximum airspeed.
- You can configure the beeper to read out in either Metric or English units.
- You can program the fourth output channel to accommodate many different flight plans.

User Controls

- You can enable either cluster or stage mode on pyro channel 1.
- When you use pyro channel 1 for staging, you can operate a 1st, 2nd, or 3rd stage event.
- You can configure pyro channel 2 to fire either at either inertial or barometric apogee.
- You can configure pyro channel 3 activate the low-altitude event in 100 foot/meter increments.
- You can configure the low-altitude event in either Metric or English units.
- You can configure pyro channel 4 to:
  - Activate an event based on data from a 3.3v or 5.0v user-provided sensor.
  - Activate an additional event based on data from the barometer or accelerometer.
  - Turn off the same or a different event.
- You can also delay activating any channel's event. The delays are set in 0.1 second increments in a range from 0 to 25 seconds.
- You can connect your HCX to a personal computer using the G-Wiz USB or RS232 Interface Cards. The Communication Interface cards attach to the communication interface socket. This card is the same one used for the LCX and MC2 flight computers. Once the flight computer is connected, you can upload configurations and firmware upgrades through your personal computer.
- You can set the recording rate between 66.67 samples per second and 500 samples per second in 6 user selectable settings. Recording bit depth is 12-bits per sample.

Data Storage

- The firmware is stored in flash memory, and can be conveniently upgraded by the user when new versions are released by G-Wiz Partners.
- The flight computer records flight data on a removable Mini-SD memory card.
- The Mini-SD card can record multiple flights between downloads.
- The included SD card adapter allows convenient download of flight data to your personal computer.

FlightView Software

- Available for Windows, Macintosh, and Linux systems.
- Use it to:
  - Download flight data recorded during the flight from the Mini-SD memory card.
  - Analyze and chart the recorded and calculated data from your flight
  - Save the flight data to your personal computer.

- Configure your HCX flight computer.
- Bench test your HCX flight computer.

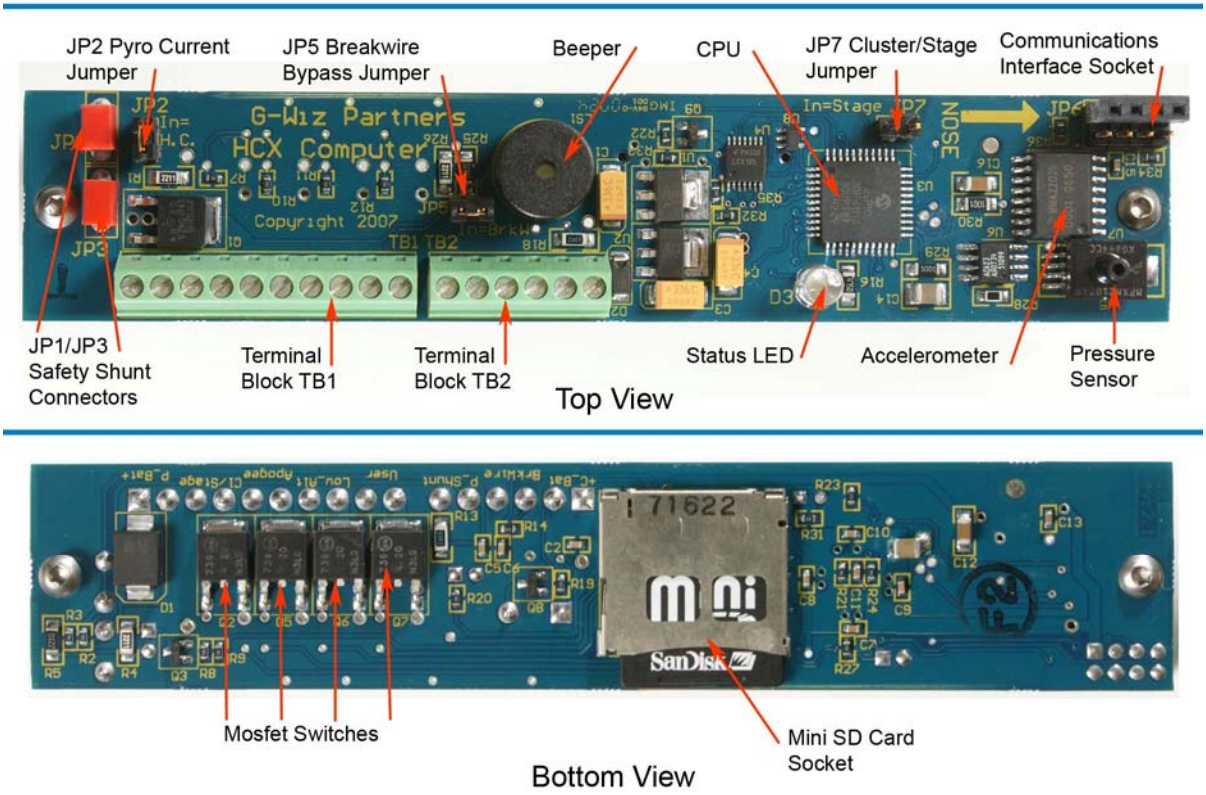
Power

- In low current mode, a single battery powers both the flight computer's CPU and the pyro ports.
- In high current mode, dual batteries can provide up to 8 amps of current to your pyro devices.

Safety

- The on-board safety shunt is wired in parallel with the terminals of an optional external shunt. This allows you to place a pyro safety switch wherever you want in your rocket.
- High current, open drain, power MOSFET switches initiate the pyrotechnic events.
- The reverse-protection diodes protect your flight computer from the damage that could be caused if you accidentally connect a battery backwards. They also prevent unwanted high current events from occurring on the pyro ports.
- If you have configured your flight computer for breakwire detection, the firmware checks the port's continuity at power-on and sounds an alert if the break wire's circuit is open.
- The firmware prevents the stage/cluster port from firing if the rocket has already passed apogee.

Using your Flight Computer



- **CPU** – The RISC processor that controls the Flight Computer.
- **Mini-SD Card Socket** – Insert a Mini-SD card to record your flight data.
- **MOSFET** – The MOSFET semiconductor switches are a safety feature which reduces power consumption and heat generation.
- **Accelerometer** – The inertial acceleration is continually monitored during flight. The acceleration data is used to calculate the integrated altitude.
- **Pressure Sensor** – The barometric pressure is continually monitored during flight. The barometric data is used to calculate the pressure altitude of the rocket, based on the US Standard Atmosphere Model.
- **JP1 & JP3 Safety Shunt** – When the safety shunt plug is inserted into these connectors, the pyro ports will not fire. The pyro ports will still detect continuity and will report their status when the flight computer is powered on.
- **JP2 Pyro Current Jumper** –With this jumper OUT, the computer will be in low power mode, limiting the current at each pyro port to 1 amp. With this jumper IN, you can use up to 8 amps from your batteries at each pyro port.
- **JP7 Cluster / Stage Jumper** – When this jumper is IN, pyro 1 will fire at the burnout event you choose. When the jumper is OUT, pyro 1 will fire when launch is detected; approximately half a second into the flight.
- **JP6 Communications Interface Socket**. – This connector attaches to either the G-Wiz USB or RS-232 Interface cards.

- **JP5 Breakwire Bypass Jumper** – This jumper must be **IN** when you use a break wire for launch detection, and OUT when you use the BreakWire/Analog input to record data from a user-provided sensor.
- **Terminal Blocks** – The pins in the two terminal blocks are used to attach wires to the Flight Computer. Their functions are shown in this graphic:

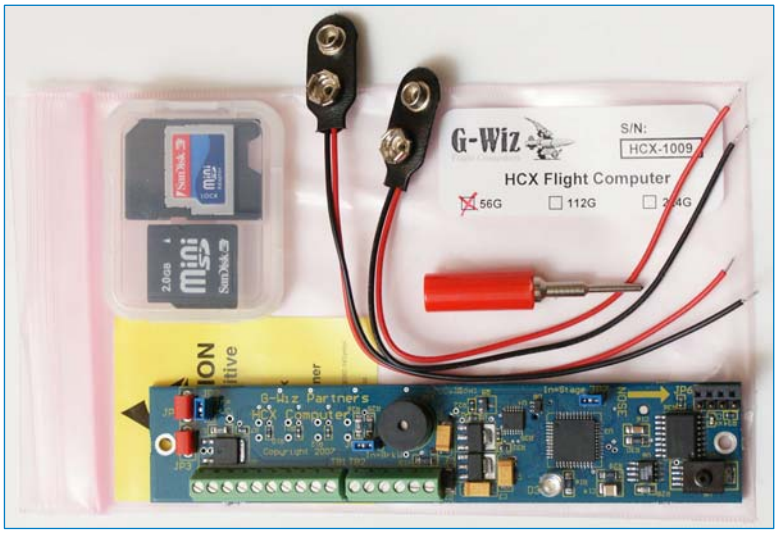
TB1 - Pyro Port Pin Assignments										TB2 - Power / Special					
Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
P Batt+	P Batt-	Pyro 1	Pyro 1	Pyro 2	Pyro 2	Pyro 3	Pyro 3	Pyro 4	Pyro 4	Shunt	Shunt	Input	Input	C Batt-	C Batt+
Pyro Battery		Cluster / Stage		Apogee		Low Altitude		Programmable		Pyro Shunt		B Wire / Analog		CPU Battery	

  - The Pyro Shunt port is a parallel input to the JP1/3 safety shunt. Breaking this connection arms the pyro ports.
  - The BreakWire/Analog port is used in conjunction with the breakwire bypass jumper.
- **Beeper** – Gives an audible status indication.
- **Status LED** – Gives a visual status indication.

Your Flight Computer and Accessories

Your flight computer comes in a pink antistatic zipper bag and also has these accessories:

- Safety shunt plug
- Mini-SD card and adapter
- Two 9v battery adapters
- Information sheet
- Three small black jumpers attached to their pins



Retain the antistatic bag to store your flight computer between uses.

Two nine volt battery adapters are included for your use. If you misplace or damage either of the adapters, please make sure to purchase high quality, well constructed battery adapters. Cheaply made adapters might lose contact under the stresses of flight computer acceleration, potentially causing catastrophic failure.

Setting Up your HCX for Flight

While the specific setup of the flight computer will vary depending on your rocket and your flight plan, the basic procedure remains the same.

- For more detail on setting up the hardware, see the task specific sections later in this chapter.
- More information on the software is available in the ***Using FlightView Software*** section.
- Several specific hardware setups are shown in the Cookbook for Launch Setups chapter of the First Flight tutorial manual.
- A quick reference chart is available for download at our web site: http://www.gwiz-partners.com/Downloads.

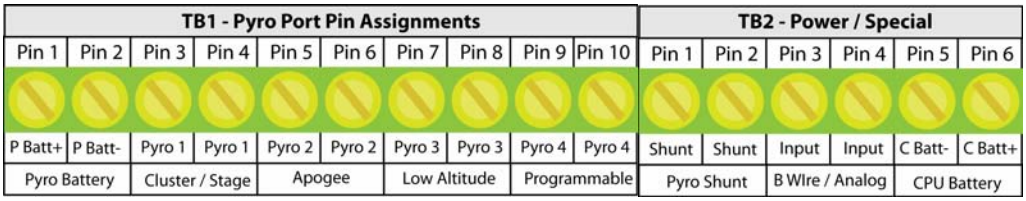
Basic Setup Procedure

To Set Up the On-Board Hardware

1. Install the shunt plug
2. Insert a FAT formatted Mini-SD card into the socket on the bottom side of the flight computer.
   - See ***Formatting Mini-SD Cards*** later in this chapter for more information.
3. Set the jumpers according to your flight plan. Refer to the table for specific jumper data.
   - See ***Setting the Jumpers*** later in this chapter for more information.

	IN	OUT
JP2	High current mode	Low current mode
JP7	Stage mode	Cluster mode
JP5	Breakwire launch	User analog input

To Attach Devices to the Terminal Blocks


TB1 - Pyro Port Pin Assignments
Pin 1 Pin 2 Pin 3 Pin 4 Pin 5 Pin 6 Pin 7 Pin 8 Pin 9 Pin 10
P Batt+ P Batt- Pyro 1 Pyro 1 Pyro 2 Pyro 2 Pyro 3 Pyro 3 Pyro 4 Pyro 4
Pyro Battery
Cluster / Stage
Apogee
Low Altitude
Programmable
TB2 - Power / Special
Pin 1 Pin 2 Pin 3 Pin 4 Pin 5 Pin 6
Shunt Shunt Input Input C Batt- C Batt+
Pyro Shunt
B Wire / Analog
CPU Battery

Battery Power

- For more information on battery usage, see ***The HCX Power System*** in the next section.
- For instructions to wire up your batteries, see ***Attaching Battery*** later in this chapter.

External Shunt

- Depending on your rocket, you may want to use the external shunt instead of the on-board shunt. See the ***Using an External Safety Shunt*** section later in this chapter for more information.

Pyro Devices

- If you are using motor deployment, skip this section.
- If you are using Cluster or Staging, attach its ejection charge to the Pyro 1 terminals (TB1 pins 3/4).

- If you are deploying a chute at apogee, attach its ejection charge wiring to the Pyro 2 terminals (TB1 pins 5/6).
- If you are deploying an additional chute, attach its ejection charge wiring to the Pyro 3 terminals (TB1 pins 7/8).

BreakWire/ Analog Port

- For more information on using this port, see "***BreakWire/Analog Terminals***" later in this chapter.

To Test the Setup

1. Install the shunt plug or close the external shunt circuit.
2. Power the unit on.
3. Confirm that the flight computer status is giving the correct status beep code. See ***Testing the Setup*** later in this chapter, or ***Appendix B***, for a complete list of the status codes.

To Change Configuration Settings

- The instructions for configuring your flight computer, including descriptions of the options available, are located in the ***Configuring your HCX*** section of the ***Using FlightView Software*** chapter.

The HCX Power System

Depending on your flight plan, you can operate the HCX with either one or two batteries.

- Nine volt batteries are optimal for all applications on this flight computer.
  - Use batteries in the 7.5v to 15v range for the pyro circuit.
  - Use batteries in the 7.5v to 12v range for the CPU and the CPU & pyro circuits.

What the Jumper Does

The JP2 jumper sets the current allowed in the system. When JP2 is pulled **OUT** your HCX is set to low current mode. When JP2 is put **IN**, your HCX is set to high current mode.

In low current mode, your pyro port current is limited to 1 amp whether you are using one or two batteries. In high current mode, you can use up to 8 amps of power at each of your pyro ports.

- If you put the JP2 jumper **IN** (high current mode) when you have only one battery attached, the pyro circuit firing may draw too much power away from the CPU, causing it to reset mid-flight.
- If you pull the JP2 jumper **OUT** (low current mode) when you have two batteries attached, you will get a maximum of 1 amp at each of your pyro ports no matter what size battery you use.

When to Use One Battery

When you use a single battery, it is responsible for running the computer and firing any pyro devices you have hooked up. You should use a single battery only when:

- You do not have any ejection charges.
- You are using a low power ejection charge.

You can test your ejection charges using the ***Bench Testing*** feature in FlightView.

When to Use Two Batteries

When you use two batteries, one powers the CPU circuit and the other powers the pyro ports. This setup eliminates the risk of staging or ejection drawing power away from the CPU.

Pulling the JP2 jumper **OUT** allows up to 8 amps of power to go to each of your pyro ports. This is of course limited by the size of the battery you attach to your pyro circuit. At full charge a Duracell 9V battery will provide approximately 5 amps of power to each pyro port.

Always use two batteries when:

- You are using high power ejection charges.
- You are igniting cluster or stage motors.
- You want to be sure that your pyro ports will not take power away from your CPU.

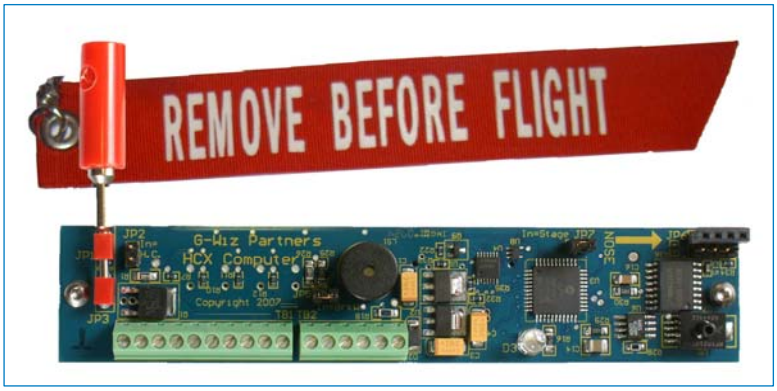
Other Battery and Power Information

When you use a single battery, it needs to power both the CPU and pyro circuits. You must attach a jumper wire between the positive CPU and Pyro terminals (TB1 pin1 to TB2 pin6). If you forget to attach the jumper wire, your HCX will beep out the Low Battery warning.

If you are using two batteries, we recommend that you disconnect the pyro battery whenever you disconnect the CPU battery. Although the shunt plug will make safe the pyro ports, the pyro circuit has a noticeable power drain. It will deplete your battery if it is left connected for long time periods.

Setting up the On-Board Hardware

Using the Safety Shunt



Unless you are using motor ejection, it is recommended that you **always** include a pyro shunt in your flight computer setup.

The HCX includes a built-in safety shunt (JP 1/3) and its shunt plug. Any time the HCX is mounted in the rocket in a position where you can insert the shunt plug through a hole in the airframe, the built-in shunt is the most practical method to safe your pyro ports.

When the shunt plug is properly installed, connecting JP1 and JP3, it protects the pyro ports from accidentally firing.

In normal use, insert the shunt before you power the unit on, and remove it, on the pad, only after all other prep work is completed.

Once you remove the shunt, the flight computer will arm the pyro outputs, enabling them to fire when they are signaled by the firmware.

This picture shows the safety shunt correctly installed into the JP1/JP3 shunt connectors.

The HCX also has an additional parallel safety shunt input on TB2 pins 1/2. If either circuit is closed, the pyro ports will not fire. You can use this shunt connection if your application does not allow you to easily install and remove the plug from the built in shunt. See the ***Using an External Safety Shunt*** section later in this chapter for more information.

Formatting Mini-SD Cards

Put the Mini SD memory card into its adapter and connect it to your personal computer. Your operating system can format it like any other removable storage device. If your personal computer gives you a choice of formats, use FAT or FAT32 formatting.

Because the flight computer records at a very high data rate, it pre-allocates a file on the Mini-SD card. This file must be continuous on the card; it **cannot have any fragments**. The flight computer will sound an error code during the power-on test if it cannot allocate a file of the correct size. You will have to reformat or replace the Mini-SD card before you can fly.

We recommend that you use a freshly formatted card for each series of flights and do not use your flight computer's Mini-SD for any other uses. If you use your flight computer's Mini-SD card for other uses, it will quickly become fragmented and unable to allocate the required space

Setting the Jumpers

The hardwired jumpers have the following functions:

Jumper Position Number	With Jumper IN	With Jumper OUT
JP 2 -- Pyro current selection	System allows high current – you must use two batteries.	System limited to low current – you can use one battery.
JP 7 -- Cluster or stage selection	Stage mode enabled.	Cluster mode enabled.
JP 5 -- Breakwire bypass	Breakwire launch detection enabled.	User analog input (0-5v) enabled.

Using the Pyro Current Jumper

When you use a single battery, it is responsible for running the computer and firing all pyro ports. Use low current mode by pulling the JP2 Jumper **OUT**. This will to prevent the pyro ports from taking too much power from your CPU.

- When you use two batteries, one powers the CPU circuit and the other powers the pyro ports. Use high current mode by putting the JP2 Jumper **IN**. This will allow you to use higher power ejection charges on the pyro ports.

To Enable the Flight Computer for High Current Use

- Put jumper JP2 **IN**.
  - Attach two batteries to your terminal blocks.

To Enable the Flight Computer for Low Current Use

- Pull jumper JP2 **OUT**.
  - Attach one battery to your terminal blocks.

Using the Cluster/Stage Jumper

In the cluster mode, the flight computer fires the clustered motors as soon as it detects and confirms launch. This occurs approximately 0.5 seconds after the first movement of the rocket. There is also a delay factor from the time the igniter fires until the time the motor (or motors) actually ignite. See your motor manufacturer for more information on this delay.

In the stage mode, the unit fires the sustainer after your preprogrammed count of burnout events. You can also program in a delay before the upper stage ignition. See ***Configuring your HCX*** in the ***Using FlightView Software*** chapter for more details.

To Enable the Flight Computer for Cluster Ignition

- Pull jumper JP7 **OUT**.
  - Attach your pyro device wires to the Cluster/Stage terminals (TB1 pins 3/4) and configure the flight computer in FlightView to ignite the clustered motors.

To Enable the Flight Computer for Staged Ignition

- Put jumper JP7 **IN**.
  - Attach your pyro device wires to the Cluster/Stage terminals (TB1 pins 3/4) and configure the flight computer in FlightView to identify which stage is ignited and if any delays are used.

Using the Breakwire Bypass Jumper

The primary purpose of the breakwire bypass jumper JP5 is to be a mechanical sensor for launch detection. See the ***Launch Detection*** section for more information on when to use this feature. In order for the breakwire bypass system to work, you must:

- Put the breakwire bypass jumper JP5 IN.
- Attach a wire between the two BreakWire/Analog terminals (TB2 pins 3/4).
- Configure the flight computer in FlightView.

The secondary function of JP5 uses pins 3 and 4 of terminal block 2 as a data input port. If you remove the JP5 jumper, you can attach an analog sensor to TB2 pins 3/4. See ***Scaling Data from User-Provided Sensors*** in the ***Using FlightView Software*** chapter for more information on applications.

Problems that will occur if you do not make the required changes all three places:

- If you configure the break wire in FlightView and correctly install the break wire, but pull the jumper **OUT**: you do not get a warning if the break wire comes loose before launch. If the flight computer does not detect the launch, it will not record any flight data.
- If you attach the wires to the terminal block and configure it for analog input in FlightView, but put the jumper **IN**: your data is not recorded
- If you configure for breakwire detection in FlightView and put the jumper JP5 **IN**, but do not attach the break wire: you get a breakwire error warning and cannot fly until you correct the problem.

To Enable the Flight Computer for a Breakwire Launch

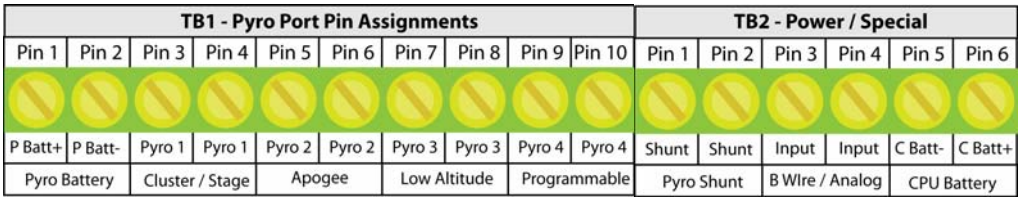
- Put the jumper JP 5 **IN**.
  - Make sure you configure the breakwire launch in FlightView and have your break wire attached to the terminal block pins.

To Enable the Flight Computer to Accept Analog Input

- Pull the jumper JP5 **OUT**.
  - Make sure you attach the sensor wires correctly and the select the **Analog Input** option in FlightView's configuration dialog box.

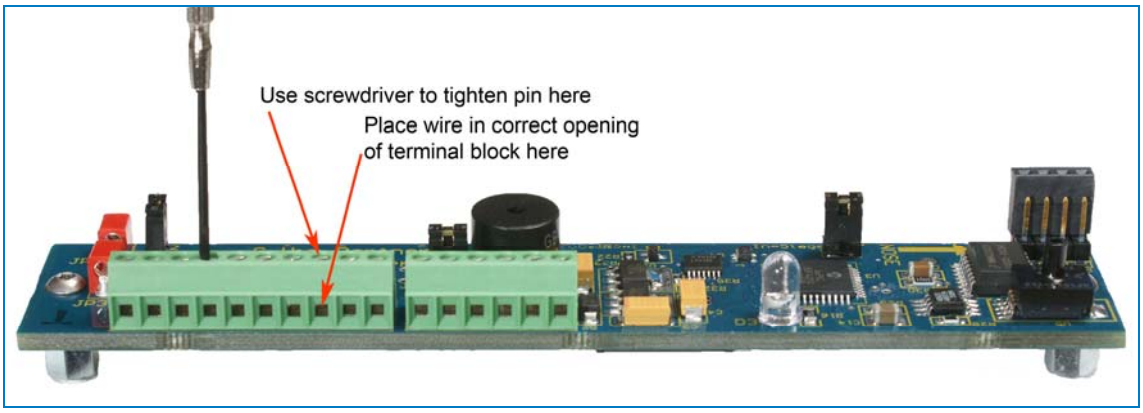
Attaching Devices to the Terminal Blocks

To attach your wiring to the flight computer, install each wire into the terminal blocks according to this schematic.



Loosen the screw at the top of the terminal and insert your wire into the opening as shown in this picture. Tighten the screw to make good contact between your wiring and the pin inside the terminal

- Make sure you insert the wires completely into the openings in the terminal blocks.
- Use a screwdriver to tighten down the pins and prevent wires from coming loose in flight.
- Make sure you attach the positive and negative wires correctly.



Attaching Battery Connectors

When you power the G-Wiz flight computer on, you will hear a series of beeps. This status readout will continue and audibly indicate any change, until 1) you power it off, 2) you link to the FlightView software, or 3) the flight computer detects launch.

To Attach Power Wires If You are Using a Single Battery

1. Attach the positive wire to the **CBatt+** terminal (TB2 pin6).
2. Attach the negative wire to the **CBatt–** terminal (TB2 pin5).
3. Attach a jumper wire from the **PBatt+** terminal (TB1 pin1) to the **CBatt+** terminal (TB2 pin6).
   - Make sure you pull the JP2 jumper **OUT**.

Caution: If you forget to attach the jumper wire in step 4 of this procedure, your HCX will beep out the Low Battery warning.

Tip: You can attach power wires for one battery to the **PBatt** terminals if your application makes using the **CBatt** terminals difficult. Make sure you attach the jumper wire between the positive **PBatt** terminal and the positive **CBatt** terminal or your flight computer will not function.

To Attach Power Wires If You are Using Two Batteries

1. Attach the wires for your pyro ports to the **PBatt+** (TB1 pin1) and the **PBatt-** (TB1 pin2) terminals.
2. Attach another pair of battery wires to the **CBatt+** (TB2 pin6) and **CBatt-** (TB2 pin5) terminals.
   - Make sure that the polarity is correct to each battery.
   - Make sure you put the JP2 jumper **IN**.

Caution: With this setup you do not use a jumper wire.

Tip: You can see pictures of both these setups in the ***Cookbook for Launch Setups*** chapter of the First Flight manual.

Using an External Safety Shunt

If you cannot use the on-board safety shunt, this terminal pair (TB2 pins1/2) is wired in parallel to the on-board shunt. It allows you to place a safety shunt switch anyplace on your rocket so you can conveniently open the circuit when the flight computer is on the pad and ready for flight.

To Set Up the External Safety Shunt

1. Attach a switched wire to the two Pyro Shunt terminals (TB2 pins 1/2).
2. Close the switch to safe your pyro ports.
3. Finish your flight computer setup per your flight plan.
4. When you have finished preparing the rocket on the launch pad, open the switch to arm the pyro ports.

Once you open the switch on the shunt, the flight computer will arm the pyro outputs, enabling them to fire when they are signaled by the flight computer.

Attaching Pyro Devices

The G-Wiz HCX has four pyro ports. Three are dedicated ports:

- Cluster/Staging on TB1 pins 3/4
- Apogee Deployment on TB1 pins 5/6
- Low Altitude Deployment on TB1 pins 7/8

The fourth port, called the FlexPort (TB1 pins 9/10) is user programmable in FlightView. It has many uses including:

- Backing up the primary ejection system.
- Flying a rocket with more than two stages.
- Using cluster launch and multiple-stage ignition during the same flight.
- Turning a camera on and/or off.
- Activating an event based on data from a user-provided sensor.

If you have set up your HCX flight computer to use one battery, you should test your electric matches before flying. Many brands of electric matches will not ignite at the power levels provided by one battery. You can test igniters and other devices for your flight computer using the ***Bench Test*** feature of FlightView. Detailed information on using **Bench Test** is available in the ***Using FlightView Software*** chapter.

BreakWire/Analog Terminals

Caution: If you are using these terminals, make sure you set the JP5 jumper correctly.

To Set Up for a Breakwire Launch

- Attach a wire between the two BreakWire/Analog inputs. It must be long enough that you can place it in a location where it will break during launch.
  - Make sure you configure the breakwire launch in FlightView.
  - Make sure you put the JP5 jumper **IN**.

To Attach a User-Provided Sensor on the BreakWire/Analog Inputs

1. Attach the positive wire of the sensor to pin 3 of terminal block 2.
2. Attach the negative wire of the sensor to pin 4 of terminal block 2.
   - Make sure you configure the sensor in FlightView.
   - Make sure you pull the JP5 jumper **OUT**.

Testing the Setup

Every time you power on the flight computer, it runs a diagnostic and beeps out its status. The HCX has three types of status codes:

- Normal
- Non-fatal errors
- Fatal errors

If you want to hear samples of the status codes, we have recordings on our website at http://www.gwiz-partners.com/html/hcx_beeps.html.

Normal Status Code

1. *The LED turns on then off.*
2. *The LED turns on and the beeper gives one (JP7 OUT) or two (JP7 IN) low pitch beeps.*
3. *LED turns off.*
4. *The sequence pauses for a half second.*
5. *Starting with Pyro Port 1, each pyro port reports status, with a single quick "beep" for good continuity or a double "beep" for incomplete continuity.*
6. *The sequence repeats from step 2 after a one second pause.*

Non-Fatal Error Status Codes

The **Non-Fatal** error codes are variations of the **Normal Status** code. The specific parts defining the error are printed in boldface. While the noted problem will not prevent a launch, you must correct it before the flight if you want full functionality in your flight computer.

Low Battery

1. *The LED turns on then off.*
2. *The LED turns on and the beeper gives one (JP7 OUT) or two (JP7 IN) low pitch beeps.*

After a half second pause, the beeper gives a short warble.

3. *LED turns off.*
4. *The sequence pauses for a half second.*
5. *Starting with Pyro Port 1, each pyro port reports status, with a single quick "beep" for good continuity or a double "beep" for incomplete continuity.*
6. *The sequence repeats from step 2 after a one second pause.*

If you hear this sequence, you have less than sixty minutes before your batteries die. If possible, change your batteries to avoid the risk of losing power during your flight. If this is not possible; because your rocket is already assembled and on the pad, for example, then ask the LCO to expedite your launch.

Un-Plugged Mini-SD Card

1. *The LED turns on then off.*

The beeper gives a long, high pitch beep, then a long, low pitch beep.

2. *After a 3/4 second delay, the normal status code continues.*

If the Mini-SD card is missing or not installed correctly, the flight computer will fire all the events, but will not be able to record data.

Fatal Error Status Codes

The **Fatal Error** codes are not built on a **Normal Status** code. You cannot fly your flight computer until the problem is fixed. Most of the Power-On Self-Test failures are caused by problems with the Mini-SD card. These you can correct by reformatting or replacing the Mini-SD card.

Break Wire Error

The unit is configured for a breakwire launch but the break wire is not correctly attached.

1. *The beeper gives a short warble.*
2. *The sequence repeats after a one second pause.*

Warning: If you hear this sequence, you will not be able fly your rocket until the error is corrected. Follow these instructions to correct the problem.

To Correct the Setup, If You Want a Breakwire Flight

1. Power your unit off.
2. Attach your break wire.
3. Power on to continue.

To Correct the Setup, If the Breakwire Mode was Configured by Mistake

1. Power your unit off.
2. Attach a wire between the BreakWire terminals (TB2 pins 3/4).
3. Connect your flight computer to FlightView.
4. Go into the **Configuration** screen.
5. Click the **Analog Input** option button.

Power-on Self-Test Failure (POST Failure)

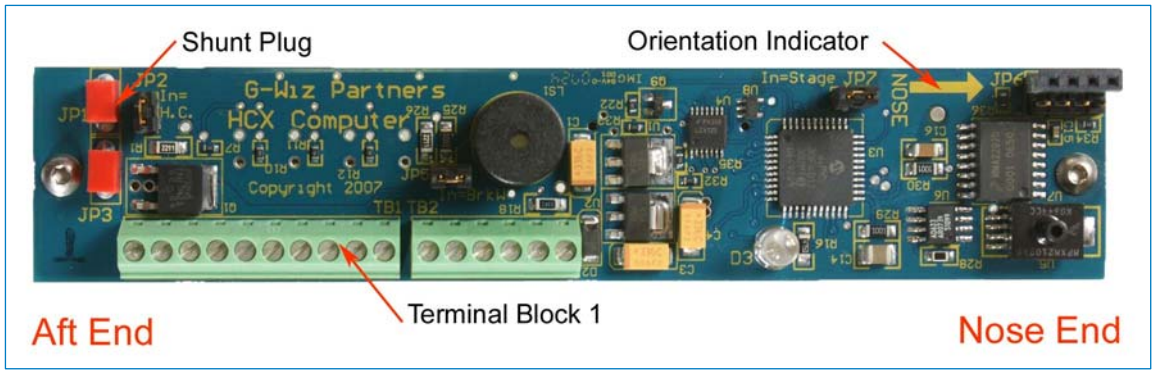
1. *The beeper gives a long warble.*
2. *After a half second delay, the beeper gives up to 7 beeps identifying the type of failure.*
3. *If you hear 5 or more beeps, there will be another half second delay, and you will hear another series of low pitch beeps giving a secondary code.*
4. *The sequence repeats after a 1 second pause.*

Warning: If you hear this sequence – Do not fly your computer! Record the number of beeps, and refer to the ***POST Failure Code Lookup Charts*** in ***Appendix B***. Unless you can correct the failure by changing SD cards, contact G-Wiz support, (support@gwiz-partners.com) before flying your unit.

Mounting the Flight Computer in your Rocket

Some considerations you should keep in mind when you build your rocket's payload bay.

- Make sure the flight computer is secured in the payload bay. Not only could a loose unit cause itself damage, but its motion will make your flight data inconsistent.
- Make sure your batteries are secured as well. During a fifty g launch, a one ounce battery weighs nearly four pounds.
- Note the proper orientation of the flight computer. The nose end of the flight computer is indicated by the word "Nose" and an arrow printed on the front of the board between the Cluster/Stage Jumper and the Communications Interface Socket (JP6).



- If you are using pyrotechnic events, make sure you either have access to your safety shunt or else design your payload bay to include a switched wire you can attach to the pyro shunt terminals (TB2 pins 1/2).
- The flight computer's barometer needs a ventilation hole into the payload bay of the rocket. For rockets measuring up to two inches in diameter, a single hole of 1/8 inch diameter, at least six inches below the nosecone transition is sufficient. For this size rocket, the shunt plug access hole provides sufficient ventilation.
- Design your wiring to allow easy access to power switches. You do not want to have to completely disassemble your rocket because the LCO has put a hold on launches until the wind dies down.
- Make sure all your connections and switches can withstand the G forces applied during the flight. Phone jack switches and twisting wires to close connections have been found to be extremely susceptible to acceleration and shock, causing catastrophic failures.

Reading Altitude Data after Recovering your Rocket

After landing, the HCX computer will begin the readout phase. The numbers are beeped out in quick sequences with very brief pauses between each number sequence.

- Zero is represented as a long beep.
- One is a single quick beep.
- Two is a pair of quick beeps.
- …
- Nine is 9 quick beeps.

After the number sequence is read out, the unit will pause for ONE FULL SECOND and then repeat the number sequences until you power off the unit.

This chart shows some examples.

Altitude (feet)	**Beep Code**
5,081	Beep, beep, beep, beep, beep (5) – long beep (0) – beep, beep, beep, beep, beep, beep, beep, beep (8) – beep (1)
12,112	Beep (1) – beep, beep (2) – beep (1) – beep (1) – beep, beep (1)
9,817	Beep, beep, beep, beep, beep, beep, beep, beep, beep (9) – beep, beep, beep, beep, beep, beep, beep, beep (8) – beep (1) – beep, beep, beep, beep, beep, beep, beep (7)

By default the system beeps out the measurements in feet. If you want to configure the unit so that the beeper reads out in meters, see ***Configuring your HCX*** in the ***Using FlightView Software*** chapter.

The flight computer must be turned off and then on before you can launch it again. Your data will be safely stored on the SD card. Each flight is saved under a sequential file number.

In the Configuration dialog box in FlightView, you can configure the HCX to read out both the maximum speed and the maximum altitude. If you select this option, the altitude and speed readouts will alternate. The status LED will light during the speed readout, and be off during the altitude readout.

Launch Detection

The G-Wiz HCX flight computer uses firmware algorithms to prevent the unit from starting prematurely. This is important, because you do not want the flight computer to assume launch has occurred if you jostle or drop the unit. The two extreme parameters the flight computer use to detect launch are:

- An acceleration of at least 2.2G for a minimum of 6/10 second. This will detect launch in most rocket motors.
- An acceleration of at least 40 G for a minimum of 2/10 second. This is often required to detect launch in high-thrust motors.

If you are not certain your rocket will trigger launch within the range of these parameters, use the breakwire port. See ***Using the Breakwire Bypass Jumper*** for instructions on using a break wire.

Flying with Hybrid Motors

Hybrid motors cause problems with some flight computers because of the chamber-pressure oscillation inherent in the hybrid design. The HCX uses DSP filtering to smooth out the thrust oscillations, allowing it to more accurately sense launch detection and to compute the inertial data.

We have successfully tested the HCX with the Rattworks hybrid motors under varying conditions.

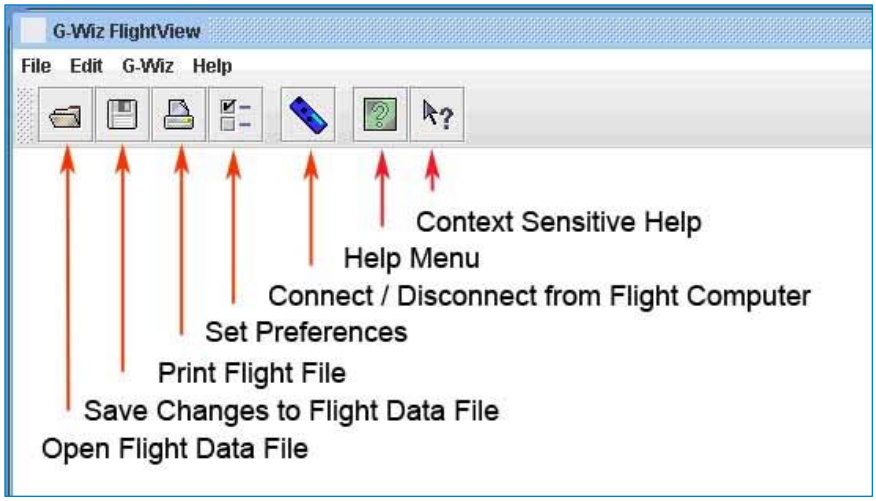
Flying with High Thrust Motors

High thrust, short burn-time motors often have too short a burn time to be detected by launch algorithms.

HCX has been tested with Aerotech WARP9 propellant. In tests, we were able to detect launch in rockets with a recommend a minimum thrust-to-weight ratio of 10:1.

If you are unsure your anticipated boost time will trigger the launch detect algorithm, then use the break wire to ensure launch detection.

Using FlightView Software



FlightView is the G-Wiz proprietary program which interfaces with the G-Wiz flight computers. Starting with version 2.8, FlightView includes configuration and data viewing support for the HCX flight computer. If you are upgrading from another G-Wiz flight computer, make sure you have the latest copy of FlightView. You only need the one program to interface with both flight computers.

To install FlightView, go to http://www.gwiz-partners.com/Downloads/install/install.html and click on the correct installer for your operating system. Follow the instructions on the page to install your software.

When you open the FlightView program you will see the main window. It has a standard menu bar and toolbar buttons. This screenshot shows the buttons marked with their functions.

Changing Your Preferences

To Set the FlightView Program Preferences

1. Start FlightView.
2. From the main window, select **Edit > Preferences** or click the **Set Preferences** button on the menu bar.
3. In the **Preferences** dialog box, select the changes you want. The options are discussed in detail in this section.
4. Select **OK**, to close the **Preferences** dialog box and accept your changes.

Options in the Preferences Dialog Box

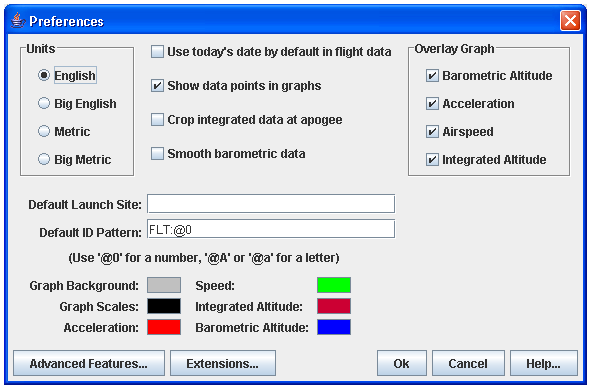
In the **Preferences** dialog box, you control how information displays in FlightView.

The **Preferences** dialog box has three types of options:

- How the data is displayed.
- Default data options
- Links to advanced features and DCS extensions.

Data Display Options

Most of the options in the **Preferences** dialog box allow you to change how your flight data is displayed.



The Units Group

In the top left corner of the Preferences dialog box is a group marked Units. Here you can choose which of the four measurement systems you want to use to display your data. Your choices are:

- **English** – Data is displayed in **feet**.
- **Big English** – Data is displayed in **miles**.
- **Metric** – Data is displayed in **meters**.
- **Big Metric** – Data is displayed in **kilometers**.

The Overlay Graph Group

In the top right corner are the options for your **Overlay Graph**. Use the checkboxes to choose which graphs to show together. If you do not choose any of the graphs, the overlay graph tab will be empty.

The Graph Color Group

The group of colored boxes in the bottom left allows you to choose the colors for your graphs. Because the same colors are used on your overlay graph, we recommend that you should use a different color for each of your graphs.

Other Ungrouped Options

Show data points in graphs - You can choose if you want to see the data points on your graphs. Even if checked, this option only takes effect when you are zooming in on a small enough graph area that the data points do not obscure the graph.

Crop integrated data at apogee - Because the accelerometer data taken after apogee is usually not very informative, you have the option to crop the accelerometer data displays at apogee. Selecting this option will give you a smaller, cleaner graph.

Smooth barometric data - If you record at a low sampling rate, you may see noise in the barometer-based graphs. Select this smoothing filter to clean up the display.

Default Data Options

Some of the other options set default data which you include when you first open a **`GWZ`** data set file.

Use today's date by default in flight data - This is a means of date stamping your files when you open a **`GWZ`** file

Default Launch Site - If you usually fly at the same site, you can type it in here. The site name will appear in the **Flight Information** tab when you open a **`GWZ`** file.

Default ID Pattern - Here you can choose a default pattern for flight ID names. These ID names are not the same as the filename prefix you set in the **Configuration** dialog box. These

names are used to identify the **GWZ** files. Every time you open a **GWZ** data set, from any flight computer or storage device, in your copy of FlightView, it is named sequentially using this pattern. This ID stays with the flight information even when you change file names. You can see this ID name on the **Flight Information** tab of your flight data window.

Extensions

The **Extensions** button connects to options, such as telemetry links, which are used exclusively in more advanced flight computer models including the G-Wiz DCS.

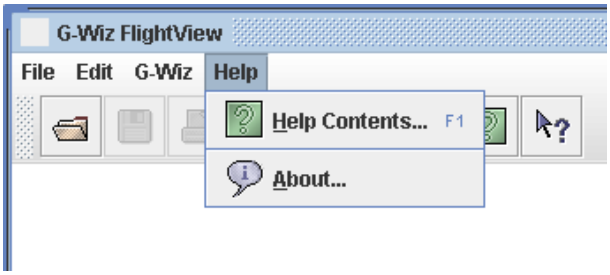
Advanced Features

We are constantly adding new abilities to FlightView. The **Advanced Features** button links to an additional dialog box with experimental features such as database searching. As we release new versions of FlightView, we will provide information about the new features on our web site at http://www.gwiz-partners.com/html/tech.html.

The Help Menu

On the **Help** menu you can access FlightView's help system.

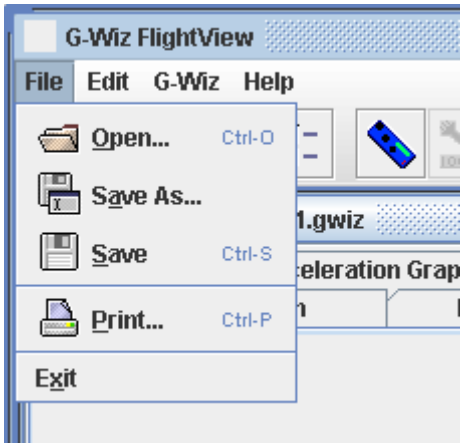
- The **Help Contents** item opens our help system.
- Select **About** for more information about FlightView, including your software revision level.



The File Menu

On the **File** menu you can open, save, and print your data.

- The **Open** command opens both memory image files from you Mini-SD card (**GWZ**) and saved flight files from your personal computer (**gwiz**). All of your flight data is accessible here. You do not need to connect your HCX to your personal computer to view and save your data.
- The **Save** and **Save as** commands will save your data to your personal computer.
- The **Print** command will print your flight data.



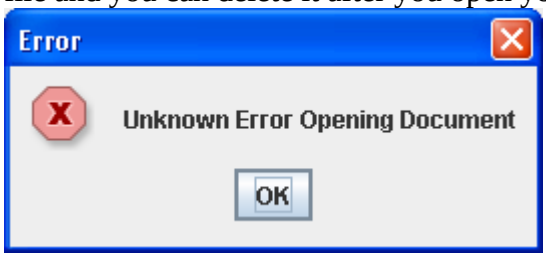
Reading your Flight Data with FlightView

A major feature of the HCX flight computer is its removable Mini-SD memory card. This card allows you to download your flight files without connecting the HCX to your computer.

- FlightView can read two data formats:
  - The **GWZ** extension files are data set files created by the flight computer.
  - The **gwiz** extension files are data files saved by FlightView.

To Read Your Flight Data from the Mini-SD Card

1. Power the flight computer off.
2. Remove the Mini-SD card from your flight computer and insert it into its adapter.
   - The Mini-SD card now fits into any of the standard SD drives available for personal computers.
3. Plug your SD card into your personal computer.
4. Start FlightView and select **File > Open** from the main menu to access the **Open** dialog box.
5. In the **Open** dialog box, navigate to the directory of your Mini-SD card.
6. Select the file name of your flight.
   - By default, the firmware names the data set files sequentially, in the form **FLT-###.GWZ**. If you want to change the flight ID naming convention, you can change it in the **Configuration** window when your flight computer is attached.
   - You may have one more file on your Mini-SD card than you had flights. This is because every time you power the flight computer on, the firmware creates a "header" file in anticipation of a flight. If you have a header file it will be the highest numbered file.
7. Press the **Open** button to open the file in the Flight Data Window.
   - If you see this message when opening a **GWZ** file from HCX, it is usually a "header" file and you can delete it after you open your flight data files.

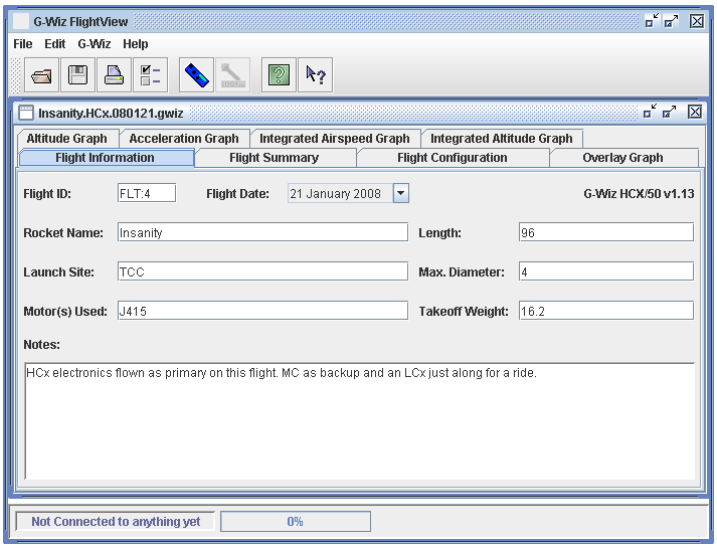


To Read a Previously Saved Flight Data File

1. Start FlightView.
2. Select **File > Open** from the main menu.
3. In the **Open** dialog box, navigate to the directory where you have saved your data file.
4. Select your flight file.
5. Press the **Open** button to open the file in the Flight Data Window.

Tip: In Windows, you can open either type of file without starting FlightView. Navigate to the file's directory and double-click on the flight file name.

The Flight Data Window



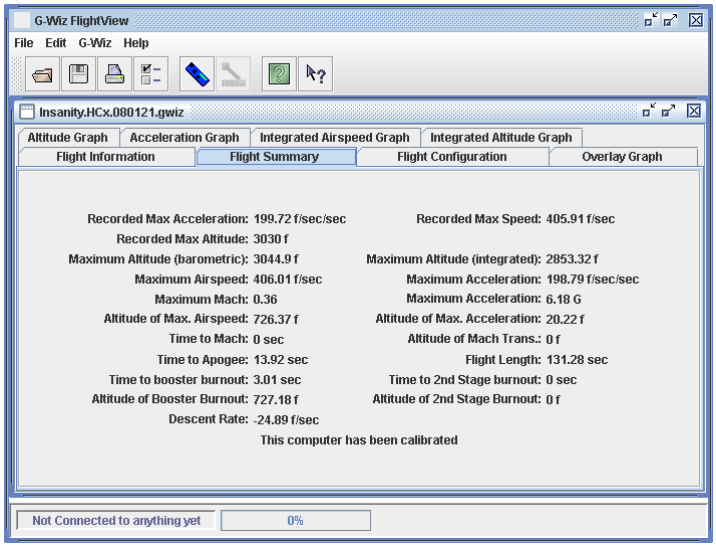
The flight data window opens up at the **Flight Information** tab.

In the top left corner is the Flight ID number. FlightView creates a sequential ID every time a new **GWZ** data set is read into FlightView, either from a flight computer's memory read or a saved file from a memory card. These IDs are not the same as the file names because they will stay with the data even if you save it to a new filename. You can change the ID pattern in the Preferences dialog box.

On the **Flight Information** tab you can fill in the fields with other information about your flight including:

- Date.
- Location.
- Rocket used.
- Motor types used.

You have ample room for additional notes about the flight.


G-Wiz FlightView
File Edit G-Wiz Help
Insanity.HCx.080121.gwiz
Altitude Graph
Acceleration Graph
Integrated Airspeed Graph
Integrated Altitude Graph
Flight Information
Flight Summary
Flight Configuration
Overlay Graph
Recorded Max Acceleration: 199.72 f/sec/sec
Recorded Max Speed: 405.91 f/sec
Recorded Max Altitude: 3030 f
Maximum Altitude (barometric): 3044.9 f
Maximum Altitude (integrated): 2853.32 f
Maximum Airspeed: 406.01 f/sec
Maximum Acceleration: 198.79 f/sec/sec
Maximum Mach: 0.36
Maximum Acceleration: 6.18 G
Altitude of Max. Airspeed: 726.37 f
Altitude of Max. Acceleration: 20.22 f
Time to Mach: 0 sec
Altitude of Mach Trans.: 0 f
Time to Apogee: 13.92 sec
Flight Length: 131.28 sec
Time to booster burnout: 3.01 sec
Time to 2nd Stage burnout: 0 sec
Altitude of Booster Burnout: 727.18 f
Altitude of 2nd Stage Burnout: 0 f
Descent Rate: -24.89 f/sec
This computer has been calibrated
Not Connected to anything yet
0%

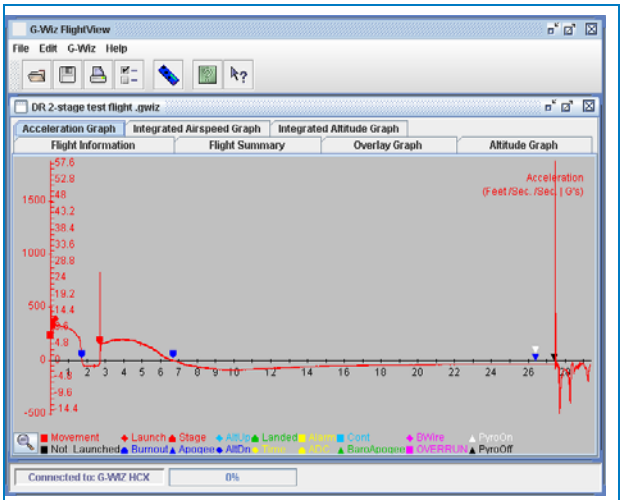
The **Flight Summary** tab gives you a snapshot look at your flight.

The other tabs contain graphs showing:

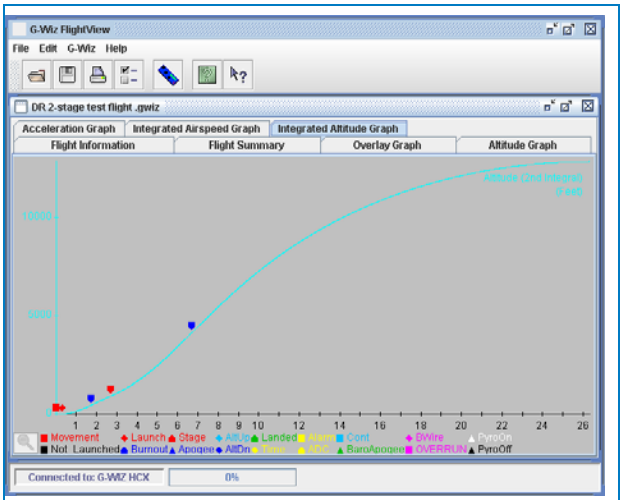
- Airspeed during the flight.
- Acceleration during the flight.
- Altitude based on data reading from the barometer.
- Integrated altitude based on data from the accelerometer.
- An overlay graph which combines several of the graphs plotted on the same time axis.

You can choose which graphs to show in the overlay tab by making selections in the **Preferences** dialog box. See ***Changing Your Preferences*** for more information.

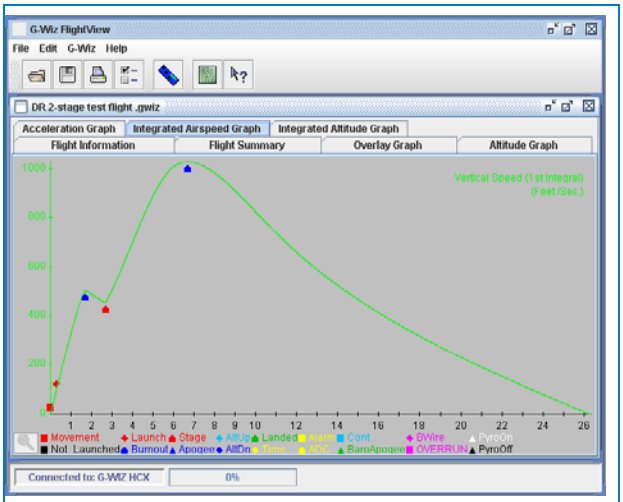
Other Data Windows in FlightView



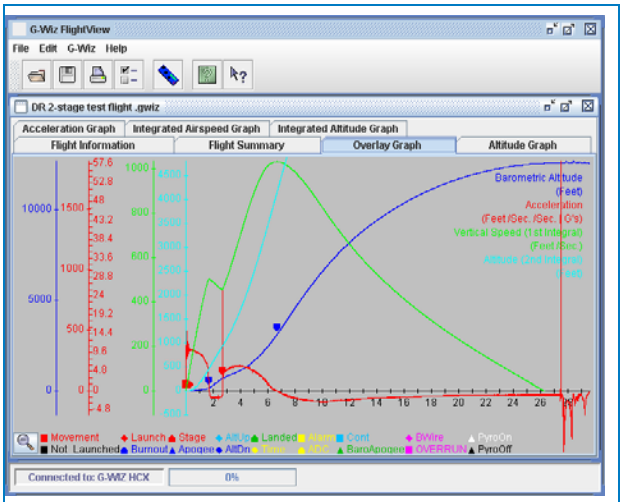
Acceleration Graph



Integrated Altitude Graph



Integrated Airspeed Graph



Overlay Graph

You can zoom in on the graphs by dragging your mouse over the time range you want to examine. Click the magnifying glass icon in the lower left corner to return the window to the original time range.

At the bottom of the graph, is a legend of the symbols that mark the events in your flight. The symbols point at the graph and are oriented so they interfere as little as possible with the graph. You can modify the display's colors in the **Preferences** dialog box.

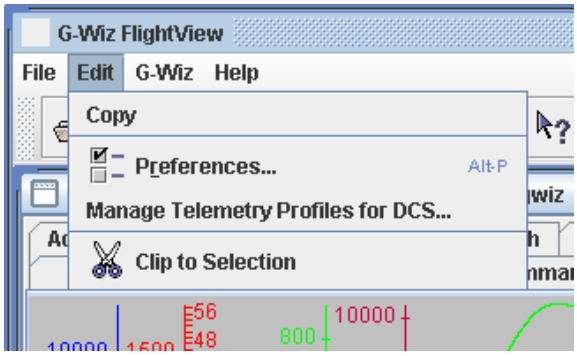
Printing your Flight Data

When you click the **Print** menu item or the **Print** button on the toolbar, all the tabs of your active data file will print. You can also use the **Copy** command to copy the graphs into another program and print them at different sizes and in multiple colors.

The Edit Menu

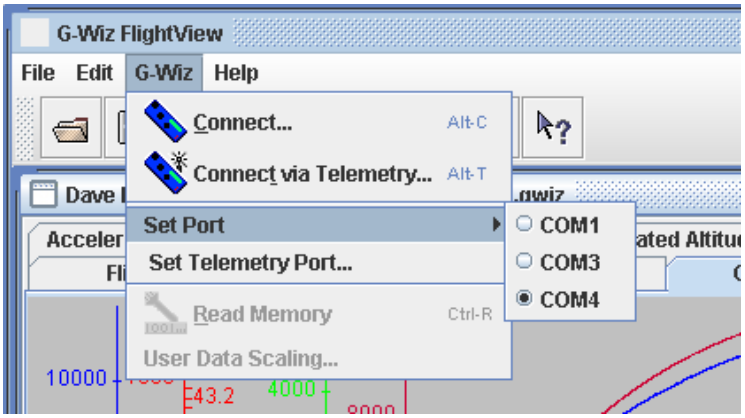
On the **Edit** menu, you can manipulate your data.

- The **Copy** command lets you copy and paste your flight data graphs to other programs.
- The **Clip to Selection** allows you to remove unneeded data from your flight file.
- You will also find the **Preferences** command here.



The G-Wiz Menu

On the **G-Wiz** menu you have specialized features relating to your flight computer.



- The **Connect** menu item.
- The **Set Port** menu item gives you a submenu of the active **COM** ports on your personal computer.
- The **Read Memory** item is unavailable because you read flight data directly from the Mini-SD card rather than through your HCX.
- The **User Data Scaling** item will become available when you open a file containing data from a user-provided sensor.
- After you connect your HCX to FlightView, you see have additional items

Caution: The **Connect via Telemetry** and **Set Telemetry Port** menu items are only used for the DCS flight computer. They will not connect to your HCX to FlightView.

Note: If you are using FlightView 2.9 or earlier, you will find the connection port list in the **Preferences** Dialog Box

Saving Flight Data to Your Computer

To archive your flight data, save it to the hard drive of your personal computer.

FlightView can save in the following formats:

- **gwiz**
- **txt**
- **csv**
- **xml**

The **gwiz** files are formatted to display in FlightView.

The **txt** and **csv** files are text formatted flight data. These formats allow your flight data to be used in spreadsheets and other analysis programs.

The **xml** is used for a more advanced data format which allows users to share the structured data on different computer systems.

When you close your memory set file, FlightView will ask if you want to save. Click **Yes** to open the **Save As** dialog box.

To Save your Data Files

- Select **File > Save as** to:
  - Give a new name to the file.
  - Save the file to a new location.
  - Save the data as a new file type.
    - If you select the **Save** option on a **GWZ** file, FlightView will open the **Save as** dialog box.
    - If you select the **Save** option on a **gwiz** file, FlightView will overwrite any information in the **Flight Information** tab. However, no flight data will be lost.

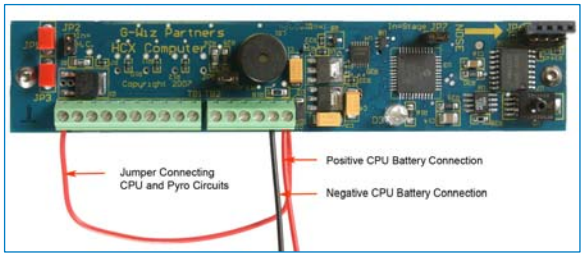
Warning: Make sure you place your save files in the correct directory on your personal computer and do not re-save them back on the Mini-SD memory card.

After all your flight data is saved on your laptop computer, format the Mini-SD card to free up continuous memory for additional flights. See ***Formatting Mini-SD Cards*** for an explanation of why this is important.

Connecting your G-Wiz HCX to your Personal Computer

You still need to occasionally attach the G-Wiz HCX flight computer directly to your personal computer in order to:

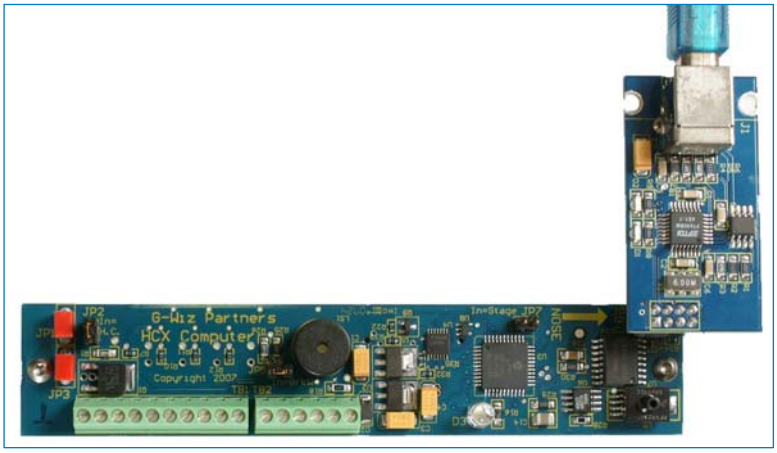
- Configure your HCX to your flight plan.
- Calibrate your HCX.
- Bench test your HCX.
- Get statistical data on the sensors.
- Update the HCX firmware.



Note: You must have power on the flight computer in order to connect it. Wire up your flight computer in single battery mode before you attach it to your personal computer. This is a picture of the flight computer in simple single battery mode. While you do not need to attach the jumper wire between the CPU and the pyro circuit, we recommended you do so because otherwise you will get a (very annoying) low battery warning.

Installing the Communication Interface Drivers

To connect your unit to a personal computer, you need either a G-Wiz USB interface card or a G-Wiz RS-232 serial interface card along with the appropriate cable. These are the same interface cards used to connect the LCX and MC2 flight computers to FlightView.



Because the G-Wiz flight computer is a serial device, its USB connection works through the serial ports of your personal computer. Select the **COM** port where your flight computer connects to your personal computer in the **G-Wiz** menu.

- If you use a USB interface card, the **COM** port is defined when you install the USB drivers.
- If you use a serial interface card, see you personal computer documentation to identify the correct **COM** port.

To Install the G-Wiz USB Interface Drivers

Note: you may need administrator access to install the drivers.

1. Start FlightView.
2. Select **G-Wiz > COM Port** and note the **COM** ports already assigned.

3. Attach the interface card to your personal computer using the supplied cable.
4. Your computer will start to install the USB drivers.
   - In Windows 95 - 2000, a dialog box will appear asking where to find the drivers. If you installed at the default location, this will be: **`C:\Program Files\GWizViewer\usbDrivers.`** (If C is your root directory)
   - If you are connecting to an OS X 10.3 or earlier Macintosh computer and have any problems, follow the procedure in described in ***Appendix E***.
   - If you are connecting to a computer running Windows XP, follow the procedure described in ***Appendix F***.
   - The procedure for Windows Vista is similar to Windows XP. The major difference is that the computer tries to look on-line for the driver before asking if you have the driver available. Follow the procedure described in ***Appendix G***.
5. After your computer confirms driver installation, look at the available **COM** ports.
6. Select the most recently installed **COM** port.

Note: If you are using FlightView 2.9 or earlier, you will find the **COM** port dropdown in the **Preferences** dialog box.

Connecting Your Flight Computer

To Connect with the G-Wiz USB Interface Card after Your Drivers have been Installed

1. Attach the interface card to your personal computer using the supplied USB cable.
2. Start FlightView.
   - The box in the bottom left of the window will say: **Not connected to anything yet**.
3. On the **G-Wiz** menu, select the **COM** port you noted during the driver installation.
4. Attach the interface card to the flight computer by inserting the 8 pin connector into the matching socket (JP6) on the HCX.
   - See the photo at the beginning of this section.
5. Power the HCX unit on.
   - It will start beeping its status.
6. In FlightView, select **G-Wiz > Connect** from the main menu.
   - The box in the bottom left of the window will say: **Connected to: G-Wiz HCX** when the connection is made.
   - If the box says **Connection Closed** or your flight computer continues to beep, check to see if your **COM** port setting is correct and if your flight computer is attached correctly.
   - If you do not know the correct port, select the highest number port on the **G-Wiz** menu first. If this port does not connect, then check the lower numbered ports.

To Connect with the G-Wiz RS-232 Serial Interface Card

Note: You do not need to install any drivers for the G-Wiz RS-232 Serial Interface.

1. Attach the interface card to your computer using a straight-through serial cable.

- Refer to your computer documentation to identify the **COM** port where you are attaching your serial cable.

2. Start FlightView.
3. On the G-Wiz menu, select the **COM** port where you attached your serial cable and interface.
4. Attach the interface card to the flight computer by inserting the 8 pin connector into the matching socket (JP6) on the HCX.
   - See the photo at the beginning of this section.
5. Power the HCX unit on.
   - It will start beeping its status.
6. In FlightView, select **G-Wiz > Connect** from the main menu.
   - The box in the bottom left of the window will say: **Connected to: G-Wiz HCX**.
   - If the box says **Connection Closed**, or your flight computer continues to beep, check to see if your **COM** port setting is correct and if your flight computer is attached correctly.

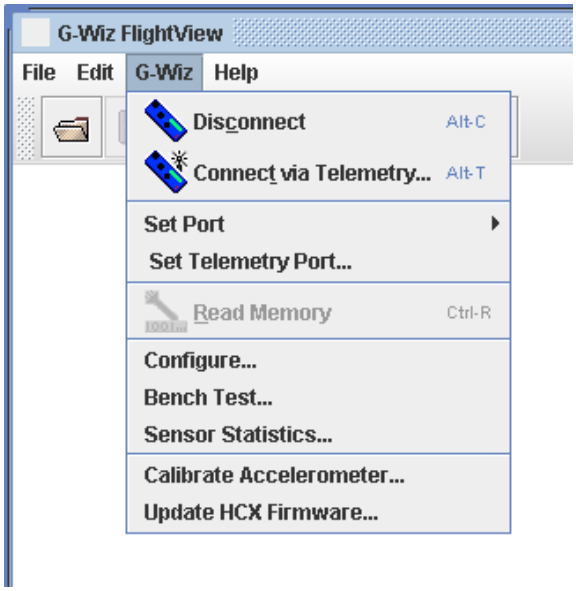
Tip: After your first connection, FlightView will save the port preference in memory. Unless you are connecting several different G-Wiz flight computer models, you should be able to skip step 3 for later connections.

More G-Wiz Menu Items

When the HCX unit is connected, the G-Wiz menu will show several additional items.

- Disconnect
- Configure
- Bench Test
- Sensor Statistics
- Calibrate Accelerometer
- Update HCX Firmware

These menu items, are described in more detail in the next few sections



Disconnecting

To Disconnect your HCX Flight Computer

1. Select **G-Wiz > Disconnect** from the menu or click the **Connect/Disconnect** button on the menu bar.
   - The box in the bottom left of the window will say: **Connection Closed** and your flight computer will start beeping.
2. Power off your flight computer.
3. Detach the flight computer from the interface card.
4. Remove the interface card and cable from your computer and store them in a safe place.

Configuring your HCX

The HCX stores its configuration settings in nonvolatile EEPROM memory. The factory default configuration settings for the G-Wiz HCX flight computer are the same as those used for the earlier G-Wiz flight computer products:

- Staging is for first stage.
- Apogee deployment occurs at inertial apogee.
- Low altitude deployment is set for 800 feet.
- English units are used.
- No delays are put into any of the events.

Your configuration settings are stored on the flight computer in EEPROM and will not change until you change them.

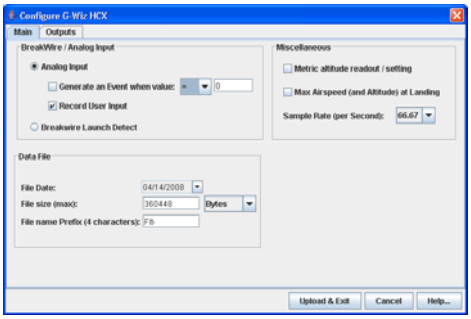
Caution: If you change your configuration for a special flight plan, be sure to change it back before your next flight.

To Configure the Flight Computer

1. Connect your flight computer to your personal computer.
   - When you are connected, the box in the bottom left of the window will say: Connected to: **G-Wiz HCX**.
2. Select **G-Wiz > Configure** from the menu.
   - The **Configuration** dialog box will appear.
3. Change the configuration on both the **Main** and **Outputs** tabs to match your flight plan.
   - The options in each tab page are described in the rest of this section.
4. Press **Upload & Exit** when you are done.
   - The **Configuration** dialog box will disappear when the process is complete.
5. Select **G-Wiz > Disconnect** from the menu.
6. Power your flight computer off. The new configuration will be ready when the flight computer is powered on again.

The Configuration Dialog Box

When you open the **Configuration** dialog box, FlightView reads the configuration memory of the HCX unit and displays the configuration data in the two tabs of the dialog box:



The Main Tab

The **Main** tab of the **Configuration** dialog box contains input options. Its functions are divided into 3 groups:

- Breakwire/Analog Input
- Data File
- Miscellaneous

BreakWire/Analog Input

The **BreakWire/Analog Input** group tells the flight computer how to use data from the BreakWire/Analog terminals (TB2 pins 3/4).

Its primary function is to be a mechanical detection for launch when your rocket/motor combination may be too fast or too slow for the acceleration sensors to confirm launch.

Important: If you are using a break wire to detect the launch, make sure to configure it on this menu as well as enabling it by putting IN the JP5 jumper.

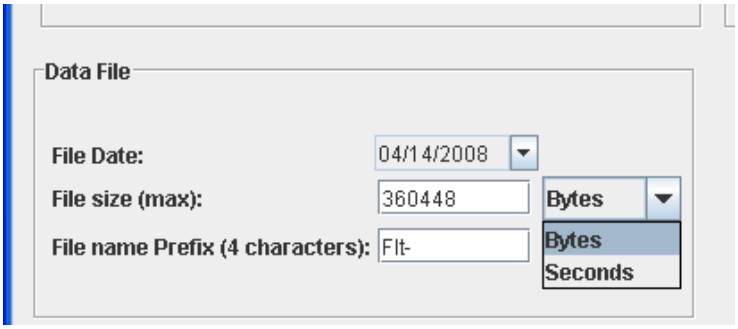
Alternately, you can use the BreakWire/Analog terminals to record data from a user-provided 3.3v or 5.0v sensor. You can use the data recorded through this port to trigger events. See ***Scaling Data from User-Provided Sensors*** for more information on applications.

Tip: If you are not attaching any wires to the BreakWire/Analog terminal, then it does not matter which option you check in this group.

Data File

In the **Data File** group you:

- Set the date to be logged when flight computer saves each flight file to the Mini-SD card.
- Define the maximum size file to use on the Mini-SD card.
- Identify the prefix for your file names to use on the Mini-SD card.



File Timestamp

To avoid weight/size penalties, the HCX does not have a real-time clock. If you want to log the flight date on your flight file, set it here.

File Size

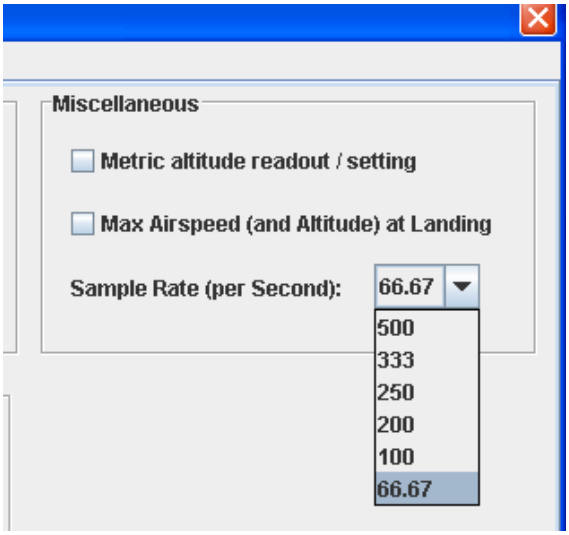
Because the HCX pre-allocates the file before each flight, you must define a maximum file size. You can set the file size either in bytes or by the number of seconds of data to record. Because the file will crop to the size at landing you can use the maximum file size without worrying about running out of space on your Mini-SD card.

While the FlightView program has a limitation on the size of file it can read, the 4 megabyte file size is still generous. Even at 500 samples per second, FlightView can read a flight lasting at least twenty minutes. But if you need to record a flight significantly larger than 4 megabyte, you can still save it in a **`txt`** format.

Filename Prefix

When your HCX writes the flight data onto the Mini-SD card it gives it a sequential file name such as **`Flt-0001.GWZ`**. You can change the first four characters of the filename here.

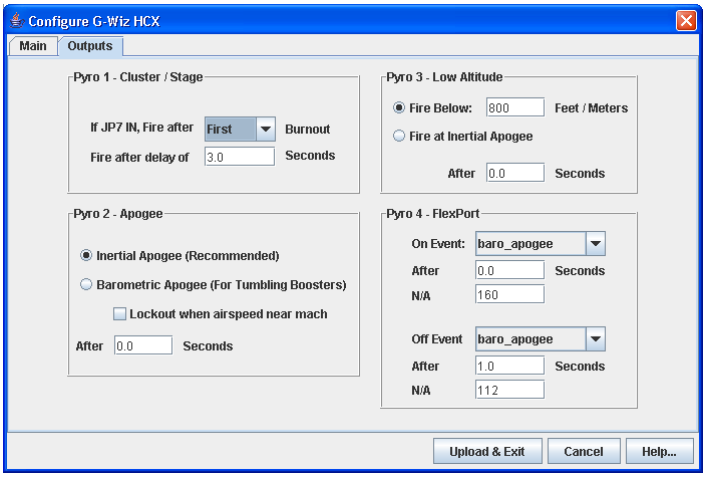
Miscellaneous



The Miscellaneous group is used to:

- Select the sample rate to use during your flight. You have a choice of six settings:
  - 66.67 samples per second.
  - 100 samples per second.
  - 200 samples per second.
  - 250 samples per second.
  - 333 samples per second.
  - 500 samples per second.
- Choose the measurement system (English or SI) for the readout at landing.
- Define if you want the maximum speed, in addition to the maximum altitude, read out after landing.

The Outputs Tab



The **Outputs** tab in the **Configuration** dialog box allows you to determine when each output should fire. Because each port has a specific function, the window is organized into a separate group for each port.

- **Pyro 1** is for cluster or upper stage ignition.
- **Pyro 2** is for apogee deployment.
- **Pyro 3** is for low altitude deployment.
- **Pyro 4** has multiple uses and is designed for you to configure according to your flight plan.

Pyro 1 – Cluster/Stage

Pyro Port 1 ignites additional motors. You attach the cluster or staging igniter's wires to pins 3 and 4 of terminal block 1.

- You can ignite a cluster at liftoff (if JP7 is **OUT**) or stage an additional motor (if JP7 is **IN**).
- You can add a delay of 0 to 25.0 seconds before triggering the event.
- When JP7 is **IN**, you can also choose which stage (1st, 2nd, or 3rd) you want to fire. The flight computer identifies how many burnouts have occurred before it fires the stage event.

Pyro 2 - Apogee

Pyro Port 2 deploys apogee devices. You attach your apogee (either drogue or main chute) igniter's wires to pins 5 and 6 of terminal block 1.

- You can specify a delay, just as you can with the pyro 1 port.
- You can configure the flight computer to use either inertial apogee or barometric apogee.

In most situations, inertial apogee is more accurate. However, barometric apogee is useful when flying strap-on boosters and in other situations where tumbling may occur because tumbling confuses the inertial apogee algorithm.

If your rocket exceeds the rated acceleration of your flight computer, the HCX will wait until barometric apogee to activate Pyro Port 2.

If you are using barometric apogee and you expect your rocket to approach or exceed Mach 1, check the **Lockout when airspeed near mach** box to prevent the shockwave at mach from causing deployment while the rocket is still accelerating.

Pyro 3 – Low Altitude

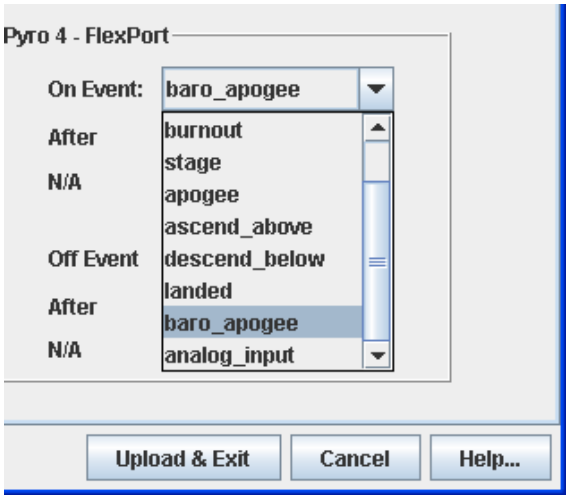
Pyro Port 3 deploys low altitude devices. You attach your low altitude (not always your main chute) igniter's wires to pins 7 and 8 of terminal block 1.

- You can deploy your chute when the rocket drops below a preset altitude. You can set the altitude, in increments of 100, anywhere from 100 to 25,500, feet or meters,
- You can deploy your chute at a given time after inertial apogee. This is a special feature included for the ARLISS flights, but may also be useful to provide two stage deployment in conditions where the computer cannot be exposed to atmospheric pressure.

Pyro 4 - FlexPort

Pyro Port 4 is user definable. You attach your output wiring to pins 9 and 10 of terminal block 1. See the ***Attaching Pyro Devices*** section of the ***Basic Setup Procedure*** for uses of this port.

You can select an event to cause this port to turn on. You can choose the same or a different event to turn the port off. Delays are possible for both on and off events. Some events may require additional information, which can also be supplied. Available events are:

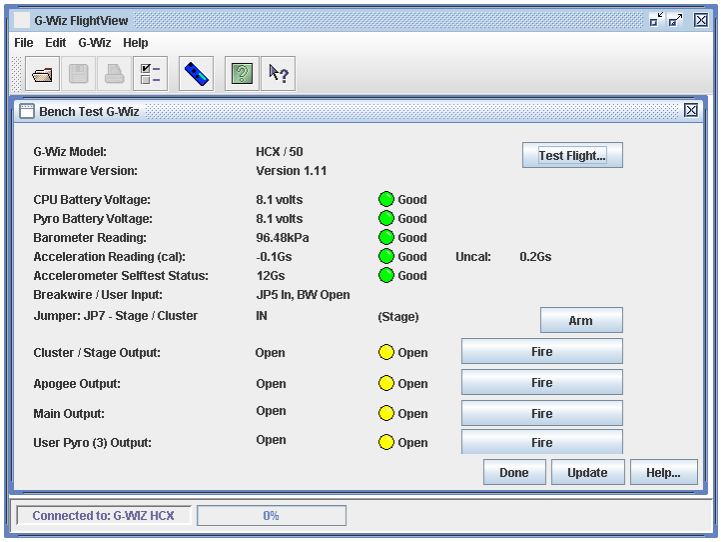


- Launch Confirmed
- Burnout N (Nth Burnout)
- Stage N (Nth acceleration)
- Inertial Apogee
- Barometric Apogee
- Ascending above <Altitude>
- Descending below <Altitude>
- Landed
- Data from a sensor attached to the analog input

After you upload the new configuration, power the flight computer off. When you power it back on, you can start using the new configuration.

Bench Testing

The **Bench Test** menu item will scan the sensors and ports of your HCX and then display this dialog box.


G-Wiz FlightView
File Edit G-Wiz Help
Bench Test G-Wiz
G-Wiz Model: HCX / 50
Firmware Version: Version 1.11
Test Flight...
CPU Battery Voltage: 8.1 volts Good
Pyro Battery Voltage: 8.1 volts Good
Barometer Reading: 96.48kPa Good
Acceleration Reading (cal): -0.1Gs Good Uncal: 0.2Gs
Accelerometer Selftest Status: 12Gs Good
Breakwire / User Input: JP5 In, BW Open
Jumper: JP7 - Stage / Cluster IN (Stage)
Arm
Cluster / Stage Output: Open Open Fire
Apogee Output: Open Open Fire
Main Output: Open Open Fire
User Pyro (3) Output: Open Open Fire
Done Update Help...
Connected to: G-WIZ HCX
0%

Here you can see the status of the sensors and the batteries. You can also see the continuity state of all the input and output ports. Each item has a value and a quick reference indicator light.

- Green is good.
- Red is bad.
- Yellow is questionable.

Continuity on the pyro outputs reads as **Good** if the igniter resistance is between 0 and 30 ohms.

Use this program to test electric matches or other output devices. The program allows you to selectively arm and fire the pyro ports if you want to test battery power or igniters.

If you want to fly a rocket with an external sensor attached to the BreakWire/Analog terminals (TB2 pins 3/4) you can test it here. You can also get actual readings by running the **Test Flight** program described in the next section.

Sensor Self-test Data		
Sensor	**Nominal Value**	**Tolerance**
Barometer	100 kPa[1] kilopascals	+/- 20 kPa
Accelerometer	-1g, 0g, or +1 g	
Accelerometer Self Test HCX/50 HCX/100 HCX/200	 12 g 30 g	 +/- 2 g +/- 6 g

Press the **Update** button to re-read all of the values.

Test Flight

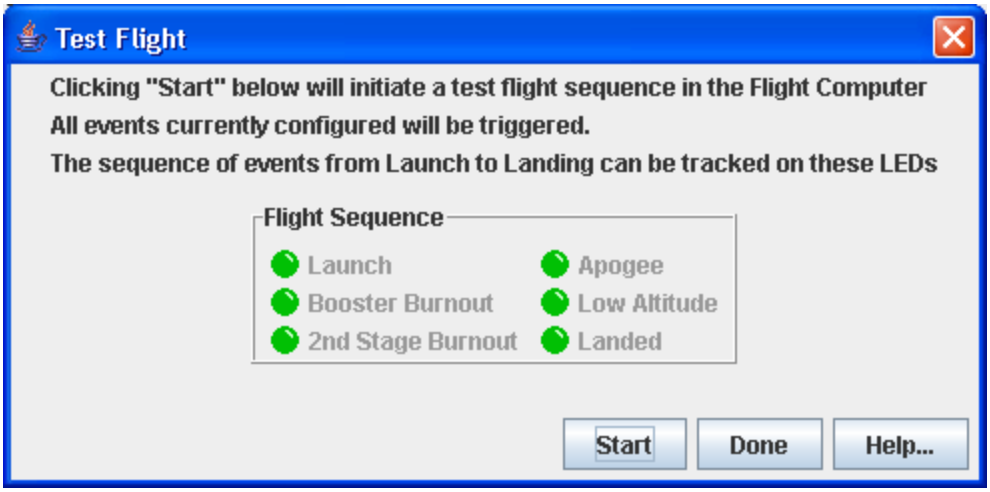
In the upper right corner of the **Bench Test** dialog box is a button marked **Test Flight**. The **Test Flight** program initiates a simple 2 stage test flight and then follows its progress. This program will test all the inertial related systems in the computer, except the accelerometer itself, by feeding simulated acceleration values to the flight computer.

The program behaves as if the data are real. You can attach electric matches or lights to the pyro ports and watch them activate.

[1] The actual value is dependent on weather conditions and the altitude where the test occurs.

To Use the Test Flight Feature

1. From the **Bench Test** dialog box press the **Test Flight** button.
2. In the **Test Flight** dialog box, press the **Start** button.
   - The flight computer will start beeping, as if it were on the pad. It will stop when it detects launch.
3. As each portion of the simulated flight completes, its LED will "light" and its name in the **Flight Sequence** box will change from shaded to black type.
4. When the flight sequence is complete, the flight computer's LED and beeper will read out the simulated altitude.
5. Press the **Done** button to close the **Test Flight** dialog box.
6. Disconnect the flight computer from the FlightView program.
7. Power the flight computer off.



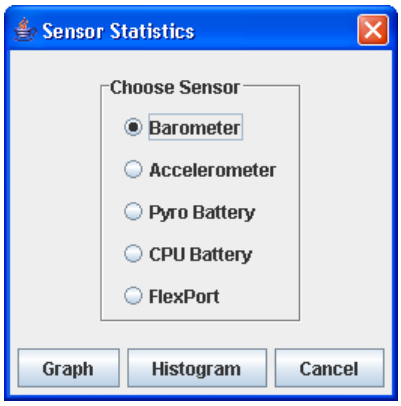
Reading Sensor Statistics

The Sensor Statistics application displays data readings from your flight computer. You can choose the barometer, accelerometer, batteries, or the analog input and see continuous readings either as a line graph or a histogram.

Its most valuable application is its ability to create real-time graphs of data from user-provided sensors you install on the BreakWire/Analog port (TB2 pins 3/4). You can use this to test your analog sensors before you fly them in your rocket.

Press the **Graph** button to get a line graph of your chosen sensor's output value.

- Press the **Histogram** button to see the data's variation.

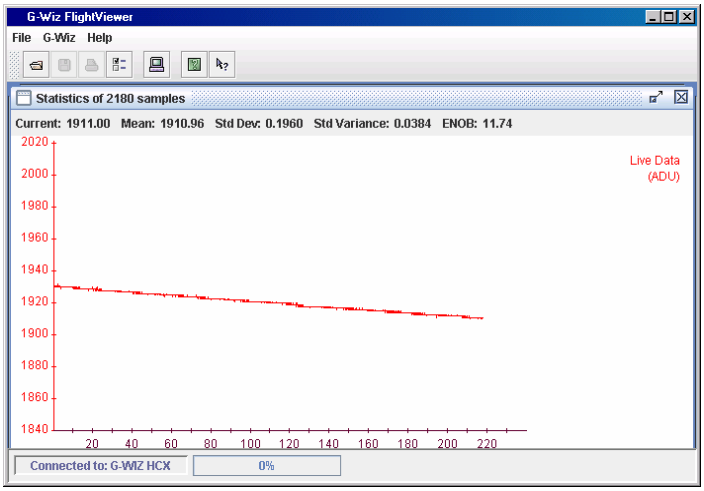


Data shown includes:

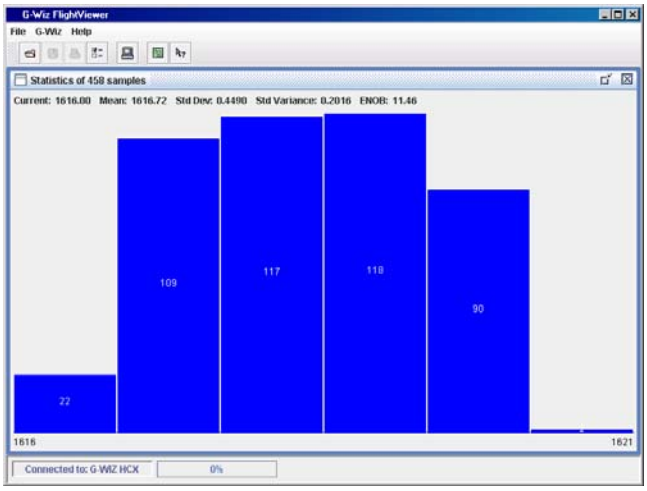
- Current – The value just read.
- Mean – That statistical mean of the last 100 samples.
- Std. Dev. – The Standard Deviation of the last 100 samples.
- Std. Variance – The Standard Variance of the last 100 samples.
- ENOB – The Effective Number of Bits. Essentially, a measure of how clean the data is.

The vertical axis of the graph is the raw ADC (analog to digital conversion) number. The data will be in the range of 0 to 4095 where 4095 is full voltage. This is proportional to the actual values you can see in the Bench Test program so these readings are useful to see noise and time-dependent changes.

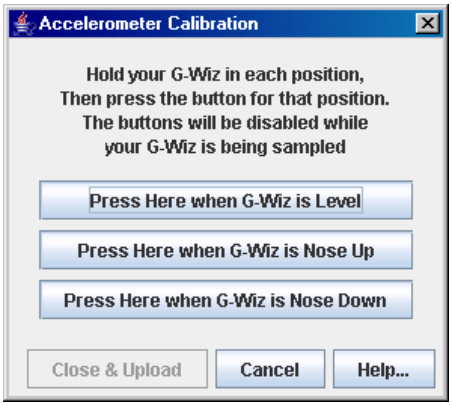
This graph shows the voltage level of a nine volt battery while the voltage dropped steadily over a period of nearly four minutes.



This is a histogram of the same battery's voltage.



Calibrating


Accelerometer Calibration
Hold your G-Wiz in each position,
Then press the button for that position.
The buttons will be disabled while
your G-Wiz is being sampled
Press Here when G-Wiz is Level
Press Here when G-Wiz is Nose Up
Press Here when G-Wiz is Nose Down
Close & Upload
Cancel
Help...

Your HCX flight computer is factory calibrated at a temperature of approximately 20°C (68°F). Unless you expect to fly at a location where the temperature is radically different, you do not need to recalibrate your flight computer.

If you do want to calibrate your flight computer, for example if you are flying at the Black Rock Desert in July, connect your flight computer to your personal computer and select **G-Wiz > Calibrate Accelerometer** from the main menu.

- The **Calibrate Accelerometer** dialog box will appear.
- Follow the instructions in the dialog box.

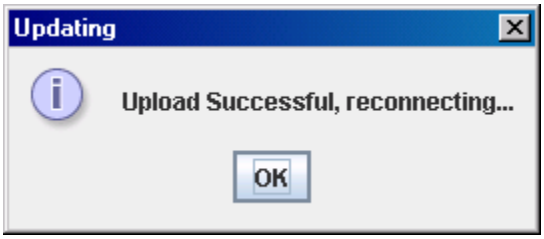
Updating your Firmware

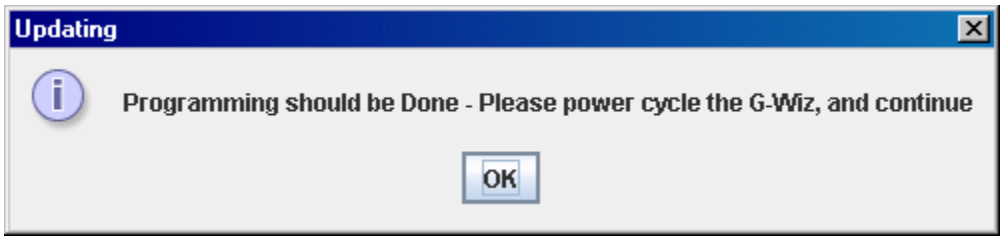
From time to time, we want to add features to our flight computers. Or we may discover a bug in the HCX firmware. Therefore we designed the HCX flight computer firmware to be customer upgradeable.

When we have an upgrade, we will make a free download available on our Web site at http://www.gwiz-partners.com.

To Update your Firmware

1. Download the **`ZIP`** file and un-archive it on to your personal computer.
2. If necessary, change firmware's filename extension to **`.update`**.
3. Attach the flight computer to your personal computer and start FlightView.
4. Select **G-Wiz > Connect** on the main menu.
5. Select **Update HCX Firmware** to display the **Open** dialog box.
6. Navigate to and select the **`.update`** file
7. Press **Open** to start the update process.
8. Make sure that nothing disturbs either computer during the update process.
   - The box in the lower left corner of the main FlightView window will show the progress of your firmware upload.
   - When the upload is complete, you will see the **Upload Successful** dialog box:
9. Click **OK**.
   - The flight computer will start beeping and you will see the progress indicator for the programming process. When it is complete you will see the **Programming** dialog box.





10. Power cycle the flight computer.
11. Click **OK**.
12. Detach the flight computer from the interface card.
    - Your update is now complete

If for any reason, the update fails, power cycle the HCX, and install the firmware again. In some cases, when the update is interrupted, the firmware will completely uninstall and the flight computer will return to the factory state. It will still connect to FlightView, but the only option you will see on the G-Wiz menu will be to install the firmware.

Caution: If multiple failures occur, report the problem to: support@gwiz-partners.com.

Scaling Data from User-Provided Sensors

As mentioned in the ***Using your Flight Computer*** chapter, the BreakWire/Analog port has an alternate function. You can use it to plug in a user-provided sensor.

This feature is designed for advanced users only. Because rocketeers can use so many different instruments on this input port, this manual does explain how to use the sensors themselves. These instructions are only intended to explain how the interface works.

Your sensor, which plugs into pins 3 and 4 of terminal block 2, must output in the 0.0 to 5.0 volt range to be recorded into the flight computer's memory.

Some examples of auxiliary instruments are:

- Pitot probes.
- Temperature sensors.
- An additional pressure sensor.
- An additional acceleration sensor.
- A scientific instrument hitching a ride on the rocket.

Overall Procedure

1. Configure the Breakwire/Analog input port in FlightView.
2. If you will use data from your sensor to generate an event, also configure the **FlexPort** in FlightView.
3. Pull the Breakwire Bypass Jumper **OUT**.
4. Attach your sensor when you set up the flight computer, negative lead to pin 3 and positive lead to pin 4.
5. Fly and recover your rocket.
6. Download your flight data file from the Mini-SD Card.
7. Scale your flight data.
8. Save your data.

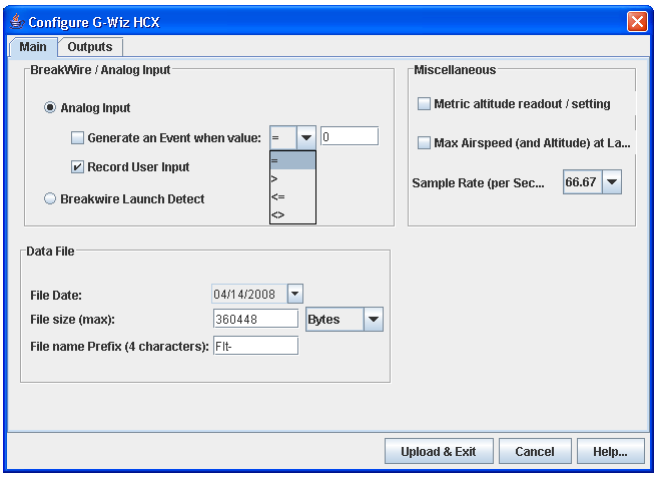
Configuring the HCX to Accept User Data

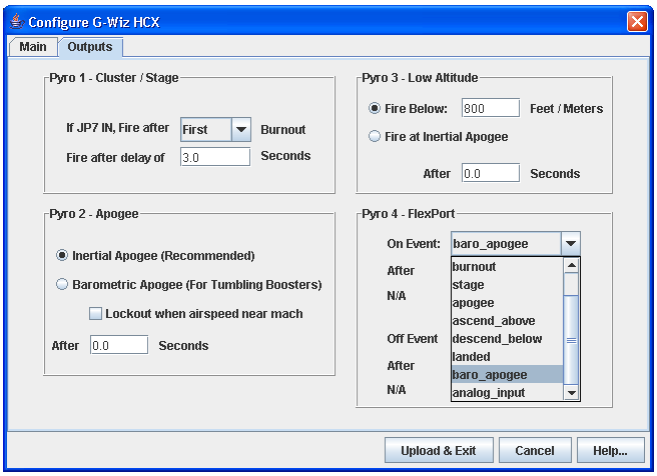
Note: Connect your flight computer to FlightView to change its configuration.

To Configure the Breakwire/Analog Port in FlightView

1. On the **G-Wiz** menu, click **Configure**.
2. On the **Main** tab of the **Configure** dialog box, click **Analog Input**.
3. Select the **Record User Input** check box.
4. Click the **Upload and Exit** button.
5. On the menu bar select **G-Wiz > Disconnect** or click the **Connect/Disconnect** button.
6. Power off the flight computer and detach it from the interface card.

To Configure the Breakwire/Analog Port and the FlexPort in FlightView





1. On the **G-Wiz** menu, click, **Configure**.
2. In the **Configure** dialog box, click on the **Main** tab.
3. Click **Analog Input**.
4. Select the **Record User Input** checkbox.
5. Select the **Generate an Event when value** checkbox.
6. Select the appropriate symbol in the drop down list to define if you want the event to trigger when the data:
   - Is exactly at the value selected.
   - Drops to or below the value selected.
   - Rises above the value selected.
   - Is no longer at the value selected .
7. Type the value at which you want the event triggered.
   - See your sensor's technical data for specifications.
8. Click on the **Outputs** tab.
9. In the Pyro 4 data box, select **analog input** in the appropriate **On Event** and **Off Event** lists, to match your flight plan.
10. Type in any delays or counts as needed.
11. Click **Upload and Exit**.
12. Disconnect your flight computer from FlightView and power cycle the unit.

To Set Up the Flight Computer for User Data Input

1. Pull the breakwire jumper JP5 **OUT**.
2. Attach the positive sensor output wire to the positive BreakWire/Analog terminal (TB2 pin 4).
3. Attach the negative sensor output wire to the negative BreakWire/Analog terminal (TB2 pin 3).
4. Install everything else per your flight plan.

To Test your Sensor

If you want to do a test run of the sensor, set up the flight computer and connect it to your personal computer.

- The **Bench Test** application shows continuity and voltage status for your installed sensor.

- The **Test Flight** application runs a simulated flight where it records the data produced by your sensor and fires any events generated by your sensor.
- The **Sensor Statistics** application shows a live data feed from your sensor.

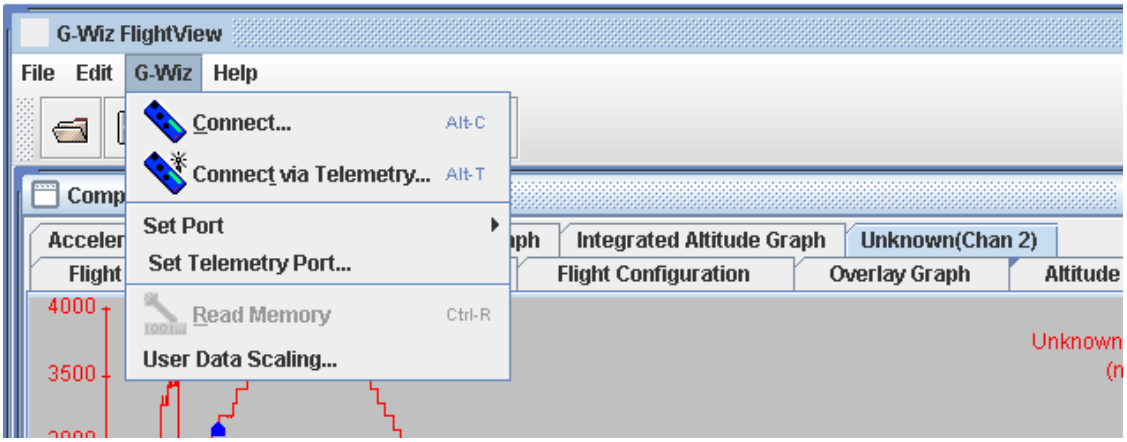
For more information, see the ***Reading Sensor Statistics*** and ***Bench Testing*** sections in this manual.

Retrieving and Scaling your Sensor Data

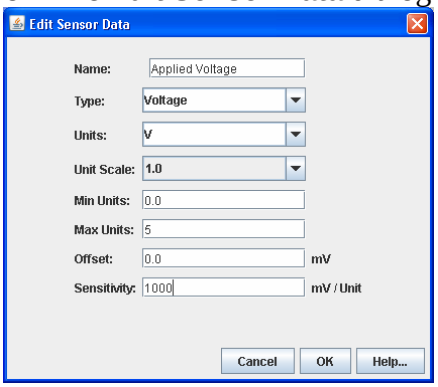
Note: The examples shown here were created with a variable resistor on the input port.

To Download and Scale your Flight Data

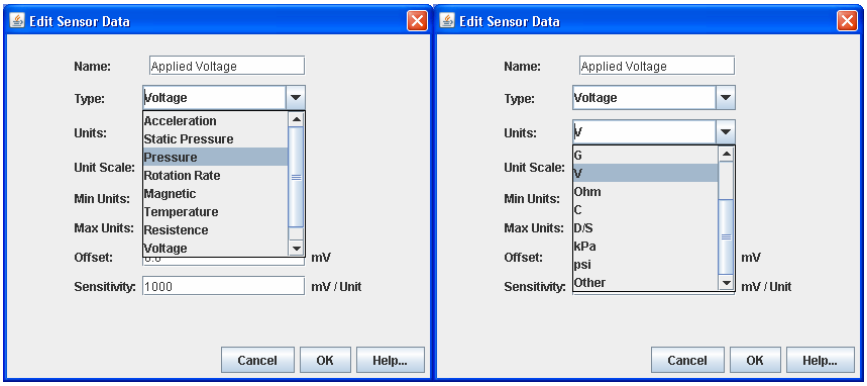
1. Put the Mini-SD memory card into your personal computer.
2. Start FlightView.
3. Open your flight file. There is a new tab on the window: **Unknown (Chan2)**.



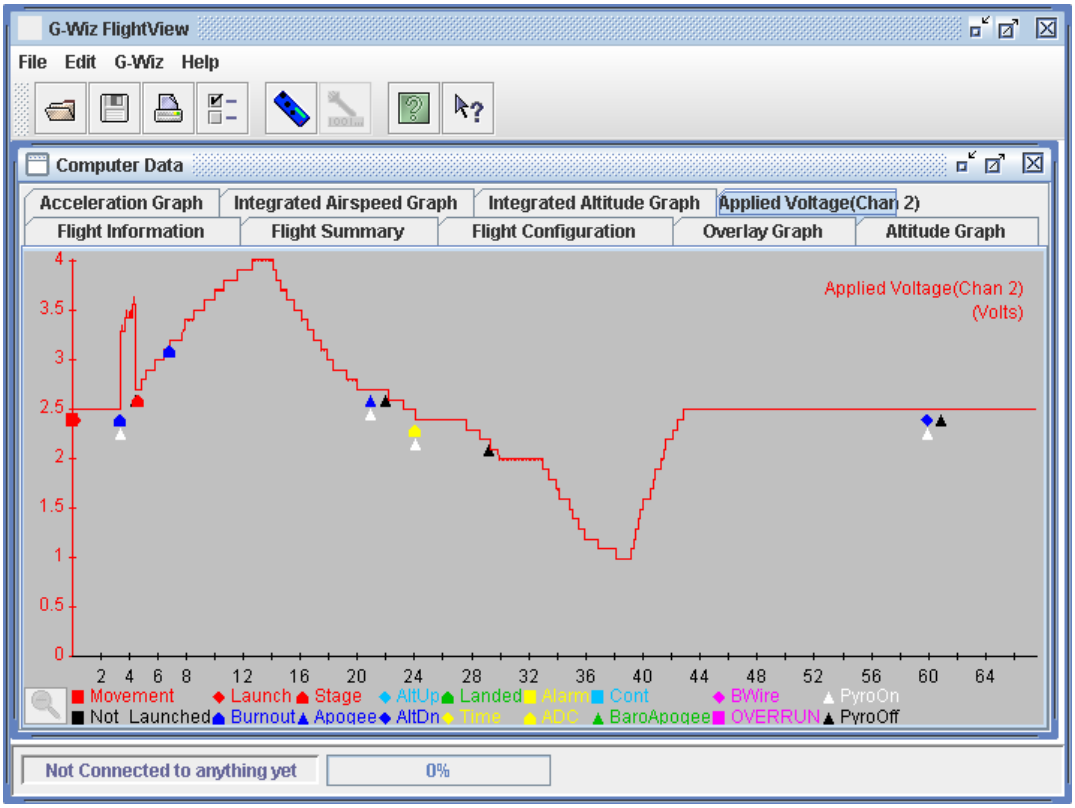
4. Click on the tab. You see no (or worse erroneous) scale or units for the data.
5. Click **G-Wiz > User Data Scaling**.
   - The **Edit Sensor Data** dialog box appears.



6. Select a name for your data.
7. Fill in the specifications on your sensor from its manufacturer spec sheets.
   - For example, the sensitivity of my variable resistor is 1000mV/unit (Volt).



8. Click **OK** to close the dialog box and save your changes.
9. In the flight data window, note that the tab now has the name you gave it in the **Edit Sensor Data** dialog box.



10. Click on the tab to see a graph of your data.
11. Save the data onto your personal computer by clicking on **File > Save As**.
12. You can also save your flight data in **`txt`**, **`csv`**, or **`xml`** formats for additional analysis.

Appendix A

Product Specifications

Parameter	HCX-50G	HCX-100G	HCX-200G
Maximum acceleration	+/- 56 G	+/- 112 G	+/- 225 G
Maximum inertial altitude (32-bit math)	100K+ feet MSL[2]		
Maximum barometric altitude (Limited by sensor linearity)	70K feet MSL		
Number of pyro channels	Four		
Maximum continuous current (Per pyro channel)	8 Amps		
Number of batteries required	One or Two (We strongly recommend using 2 batteries)		
Recommended computer battery	9 VDC transistor battery (Duracell MN1604)		
Maximum voltage applied to computer battery input terminals (TB 2 pins 5/6)	12 VDC		
Computer current consumption	65mA typical at idle		
Maximum voltage applied to pyro battery input terminals (TB 1 pins 1/2)	15 VDC		
Pyro channel test current (9VDC battery)	3.5mA		
Pyro channel firing time	Programmable		
Pyro channel functions	1: Stage/cluster 2: Apogee parachute deployment (typical) 3: Low altitude parachute deployment (typical) 4: User selectable/programmable (FlexPort)		
Low altitude pyro channel activation	Programmable (Default is 800 feet)		
ADC resolution	12-bits or 1.22 mV/bit		
Analog input channel: range / resolution	Input range = 0 to 5.0 VDC Resolution = 12-bits or 1.22 mV/bit		
Breakwire input switch requirements	Closed – to – open signals launch		
Sensor sample rate	Selectable – 66.67 to 500 samples per second		
Altitude readout	Status LED and acoustic beeper (Reads out barometric altitude)		
User field interface	1 status LED 1 beeper		
Data recording depth	Limited only by the size, in MB or GB, of the Mini-SD card used (2Gigabyte Maximum card size)		
Host computer interface	TTL/CMOS serial (Use the G-Wiz USB or RS 232 adapter to interface to a host computer)		
Main battery life (With separate pyro battery)	6 hours (typical)		
Weight (typical)	45 g	51 g	51 g
Operating temperature range	0-85°C		

[2] Flights over 25,000 feet MSL require HCX to be coated with a special epoxy layer. The coating protects the circuit board and components from condensation moisture damage. This also insures proper electrical operation of HCX. Please contact G-Wiz Partners for special order options.

Appendix B

Flight Computer Status Codes

Normal Status Code

1. *The LED turns on then off.*
2. *The LED turns on and the beeper gives one (JP7 **OUT**) or two (JP7 **IN**) low pitch beeps.*
3. *LED turns off and the sequence pauses for a half second.*
4. *Starting with Pyro Port 1, each pyro port reports status, with a single quick "beep" for good continuity or a double "beep" for incomplete continuity.*
5. *The sequence repeats from step 2 after a one second pause.*

Non-Fatal Error Status Codes

Low Battery

1. *The LED turns on then off.*
2. *The LED turns on and the beeper gives one (JP7 **OUT**) or two (JP7 **IN**) low pitch beeps.*
3. ***After a half second pause, the beeper gives a short warble.***
4. *LED turns off and the sequence pauses for a half second*
5. *Starting with Pyro Port 1, each pyro port reports status, with a single quick "beep" for good continuity or a double "beep" for incomplete continuity.*
6. *The sequence repeats from step 2 after a one second pause.*

SD Card is Unplugged

1. *The LED turns on then off.*
2. ***The beeper gives a long, high pitch beep, then a long, low pitch beep**.*
3. *After a 3/4 second delay, the normal status code starts.*

Fatal Error Status Codes

Break Wire Error

The unit is configured for a breakwire launch but the break wire is not attached.

1. *Short warble.*
2. *The sequence repeats after a 1 second pause.*

Caution: If you hear this sequence, you will not be able fly your rocket until the error is corrected. Power the unit off before correcting. See the ***Testing the Setup*** section of the ***Using your Flight Computer*** chapter for correction instructions.

Power-On Self-Test Failure (POST Failure)

1. *The beeper gives a long warble.*
2. *After 1/2 second delay, the beeper gives a series of beeps (up to 7 beeps) identifying the failure.*
   - For 1 to 4 beeps see the **Hardware Error** chart.
   - For 5 beeps, there will be an additional set of low pitch beeps. See the **Initialization Error** chart.
   - For 6 beeps, there will be an additional set of low pitch beeps. See the **File Creation Error** chart.

- For 7 beeps, the Mini-SD card is full.

3. *The sequence repeats after a 1 second pause.*

POST Failure Code Lookup Charts

Hardware Error Chart - First Set of Beeps (High Pitch)

Beep Code	Problem	Solution
1 beep	Failure reading configuration from EEPROM	**Do not fly – Contact G-Wiz**
2 beeps	Sensors reading out of range	**Do not fly – Contact G-Wiz**
3 beeps	Accelerometer self-test failure	**Do not fly – Contact G-Wiz**
4 beeps	Accelerometer status failure	**Do not fly – Contact G-Wiz**
5 beeps	SD Card initialization error – Secondary code will beep.	Count the low pitched beeps and refer to the **Initialization Error** chart.
6 beeps	SD file-creation error – Secondary code will beep.	Count the low pitched beeps and refer to the **File Creation Error** chart.
7 beeps	SD file-creation error	Not enough space. Reformat/replace card.

Card Initialization Error Chart – Second Set- Block 1 (Low Pitch)

Beep Code	Problem	Solution
1 beep	Failure to reset card.	Reformat or replace card.
2 beeps	Failure to initialize card.	Reformat or replace card.
3 beeps	Wrong file system on card.	Reformat card as FAT or FAT32.
4 beeps	SD card read error.	Replace card.
5 beeps	SD card not FAT formatted.	Reformat card as FAT or FAT32.
6 beeps	SD card partition table bad.	Reformat card as FAT or FAT32.
7 beeps	SD card partition not right type.	Reformat card as FAT or FAT32.
8 beeps	SD card read error.	Replace card.
9 beeps	SD card not properly formatted.	Reformat card as FAT or FAT32.
10 beeps	SD card, bad sector size.	Reformat card with 512 byte sectors.
11 beeps	SD card formatted as FAT12.	Unsupported format – Reformat as FAT or FAT32.

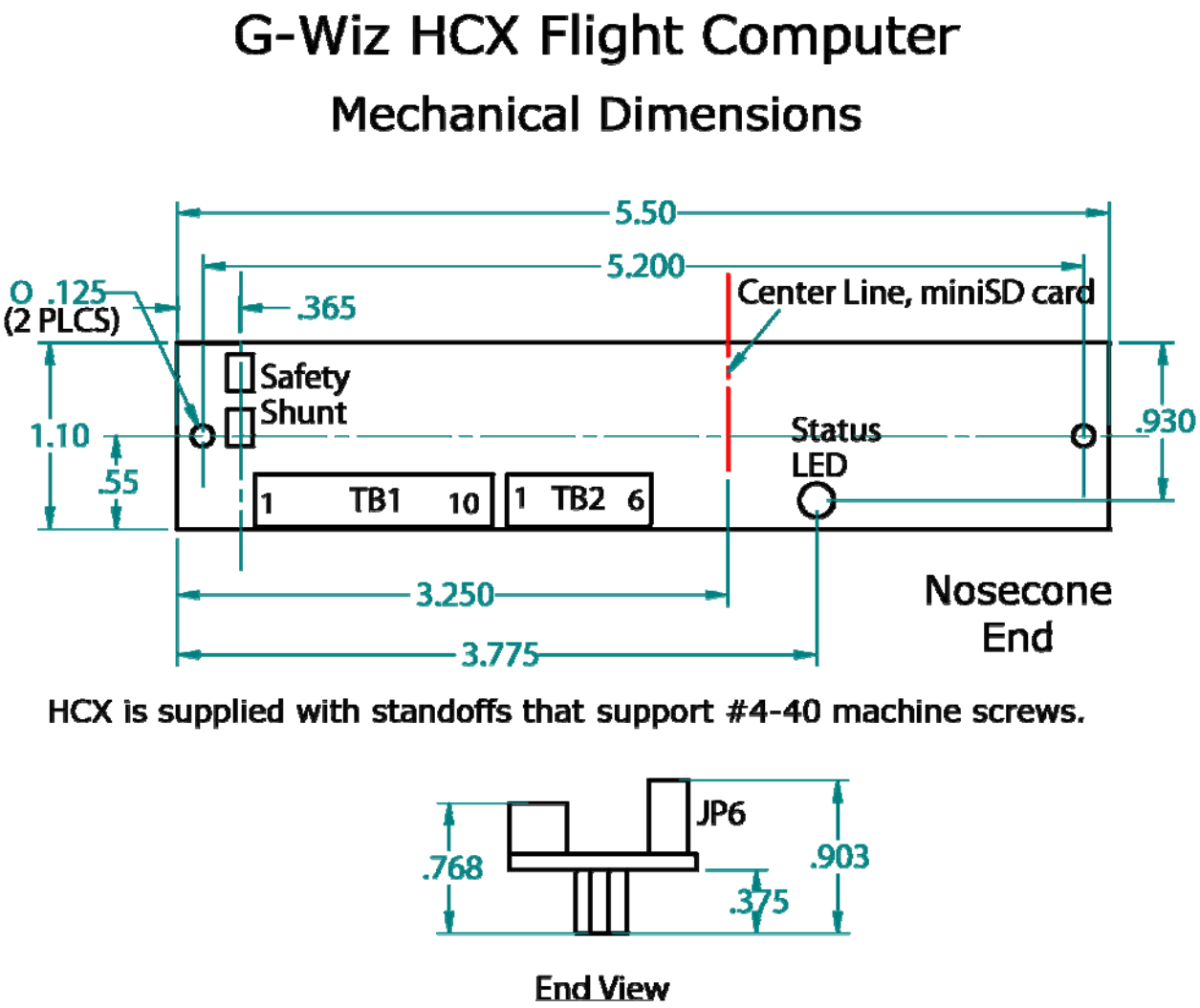
Card File Creation Error Chart – Second Set-Block 2 (Low pitch)

Beep Code	Problem	Solution
1 beep	File creation error 1.	**Do not fly – Contact G-Wiz**.
2 beeps	SD card full.	Reformat or replace card.
3 beeps	SD card write error.	Replace card.
4 beeps	SD card directory error.	Replace card.

Unless the failure is due to a SD card problem that can be remedied by changing cards, POST failures should be reported to G-Wiz Support (support@gwiz-partners.com). Do not fly the unit until the failure is repaired.

Appendix C

Mechanical Drawing



Appendix D

Technical Data

Analyzing Raw Data from the Flight Computer

```
2048,3234,0
2048,3233,0
2048,3232,0
2048,3233,0
2048,3233,0
2048,3234,0
2048,3234,0
2048,3234,0
2048,3234,0
2048,3233,0
2048,3232,0
2305,3233,0, Movement(1)
2305,3233,0
2305,3233,0
2305,3234,0
2305,3234,0
2305,3233,0
```

In addition to graphing your flight data in FlightView, you can save it in **`txt`**, **`csv`**, or **`xml`** formats for analysis with other programs.

For a discussion on how this data is used, see the article *How Flight Computers Work* on our website at: http://www.gwiz-partners.com/Flight_Computers.pdf.

A snippet of a flight data file in **`csv`** (comma separated value) format is shown in the box. The first number is the accelerometer reading and the second is the barometer reading. If you have installed a user-provided sensor, its data will be the third number. The final item will show if a status change such as launch detection or a pyro port action occurs during the measurement interval.

Each row of data is a single sample in chronological order based on the sample rate you configured before the flight.

For Example: At a sample rate of 500 samples per second, this data shows movement 0.024 seconds (12/500) after the flight computer started recording.

Reading the Accelerometer Data

These are the raw decimal sensor readings and need to be converted back into the appropriate numerical values using the specifications of the sensors in your HCX model.

The acceleration data in column 1 is output in the range of 0 to 4095 based on a twelve-bit analog to digital converter (ADC). 0 is your maximum negative acceleration, 4095 is your maximum positive acceleration, and 1G (absolute) is approximately 2048.

The core information for converting the readings is listed in the table below.

Accelerometer Specifications

	HCX 50	HCX 100	HCX 200
Processor	MMA 2202	MMA2204	MMA2301
Full Scale Range	+/-56G	+/-112G	+/-225G
Full Scale Span	4.48v	4.48v	4.50v
Sensitivity	40mV/G	20mV/G	10mV/G
Offset (0G)	2.5v Nominal (2.35v-2.65v)	2.5v Nominal (2.35v-2.65v)	2.5v Nominal (2.40v-2.60v)

For more information on the accelerometers, see the manufacturer's web site at www.freescale.com.

To get G values, you need to reverse the process. First, take the digital number and convert it back to the voltage as output by the accelerometer.

$$\frac{number - stationarynumber}{4096} * 4.48 = voltage$$

Then divide the voltage by the sensitivity:

$$(voltage)/.04\frac{v}{G} - = acceleration$$

Reading the Barometer Data

The barometric pressure data in column 2 is also in the range 0 to 4095 (12 bits). This represents pressure data from 0 to 100 kPa (approximately 0 to14 psi). The sensor used here is the MPX2102A by Motorola, connected to a low-noise op-amp.

Pressure readings start high, and decrease as your altitude increases.

Because this is a millivolt output sensor, the data is amplified by 201 times before being sent to the ADC.

Barometer Specifications MPX2102A

Specification	Before Amplification	After Amplification
Full scale range	0kPa – 100kPa	0kPa – 100kPa
Full scale span	20mV	4.03V
Offset	0	1.0 mV
Sensitivity (sensor)	.2 mV/kPa	40.28 mV/kPa

Voltage before amplification:

$$\frac{number - stationarynumber}{4096} * 20mV = voltage$$

Voltage after amplification:

$$\frac{number - stationarynumber}{4096} * 4.03V = ampVoltage$$

Divide the voltage by the sensitivity.

$$(ampvoltage)/40.28\frac{mV}{kPA} - = pressureDifference$$

The Events

As events occur, they are listed in Column 3. If an event happened in a measurement interval, this column will show the appropriate keyword. Most of the events are self-describing and are listed in the **`xml`** file below.

Exported Data in XML Format

The **xml** data file has two main differences from the **txt** file. First, all of the specific sensor data is included in the file. The other difference is the A to D conversion reads out in hexadecimal. This is a section of the same flight as the data above.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<flight>
<computer>
<manufacturer url="http://www.gwiz-partners.com">G-Wiz
Partners</manufacturer>
<model>hcx/50</model>
<version>1.13</version>
<sensors accel-index="0" baro-index="1">
<sensor index="0" name="Unknown">
<type>accel</type>
<units>Gs</units>
<min>-56.0</min>
<max>56.0</max>
<offset>2.5</offset>
<sensitivity>0.04</sensitivity>
<sample-size>12</sample-size>
</sensor>
<raw-data index="0" radix="16" sample-rate=”500”>
817,818,819,818,817,817,816,817,818,816,816,816,816,813,82e,914,8
41,867,865,85b,85e,864,862,... 7f9,7f9,7fa,7f9,7f9,0,0</raw-data>
<sensor index="1" name="Unknown">
<type>static</type>
<units>kPa</units>
<min>0.0</min>
<max>100.0</max>
<offset>0.025</offset>
<sensitivity>0.04028</sensitivity>
<sample-size>12</sample-size>
</sensor>
<raw-data index="1" radix="16" sample-rate="500">d47,d47,
d47,d47,d47,d47,d47,d47,d47,…,d47,d4,d48,d48,d48,d48,0</raw-data>
<events>
<event data="0" index="17" name="Movement"/>
<event data="0" index="117" name="Launch"/>
<event data="1" index="1504" name="Burnout"/>
<event data="0" index="1504" name="PyroOn"/>
<event data="0" index="2039" name="PyroOff"/>
<event data="0" index="7269" name="Apogee"/>
<event data="1" index="7269" name="PyroOn"/>
<event data="1" index="7796" name="PyroOff"/>
<event data="0" index="22484" name="AltDn"/>
<event data="2" index="22484" name="PyroOn"/>
<event data="2" index="22997" name="PyroOff"/>
<event data="1" index="56082" name="AltDn"/>
<event data="3" index="56082" name="PyroOn"/>
</events>
```

```
</sensors>
</computer>
<notes date="Jan 21, 2008" id="FLT:4">
<location>TCC</location>
<rocket diameter="4" length="96" name="Insanity" weight="16.2">
<motors>J415</motors>
</rocket>
<note>HCx electronics flown as primary on this flight. MC as
backup and an LCx just along for a ride.</note>
</notes>
<calibration>
<accel accel-mult="1" minus-g="33.05859375" offset="65425"
one-g="34.796875" zero-g="7.953125"/>
</calibration>
<config>
<flags/>
<actions>
<pyro-port index="1">
<continuity value="bad"/>
<event name="burnout" on="100.0" value="1"/>
</pyro-port>
<pyro-port index="2">
<continuity value="good"/>
<event name="intertial-apogee" on="100.0"/>
</pyro-port>
<pyro-port index="3">
<continuity value="bad"/>
<event name="altitude-descending" on="100.0" value="1200"/>
</pyro-port>
<pyro-port index="4" value="on">
<continuity value="bad"/>
<event name="altitude-descending" value="100"/>
</pyro-port>
<pyro-port index="4" value="off">
<event delay="100.0" name="landing" value="0"/>
</pyro-port>
</actions>
<battery name="cpu" value="8.38157958984375"/>
<battery name="pyro" value="5.3839599609375"/>
</config>
<summary max-accel="216" max-altitude="3030" max-speed="439"/>
<preflight>
<base-accel value="2072"/>
<base-accel value="3399"/>
</preflight>
</flight>
```

Appendix E

Installing USB Drivers on Macintosh

Installing the USB drivers on older Macintosh operating systems is more complex than the simple plug-and-play you get with operating systems of 10.3 and later.

To Install the USB Drivers on a Macintosh 10.2 and Earlier

1. Log onto your computer as an administrator.
2. Unless you have FlightView 2.8 or later, remove all older copies and install the latest version from our web-site at www.gwiz-partners.com.
3. Open the folder where FlightView was installed.
   - This is usually **Applications/GwizViewer**.
4. Double-click the package icon named **FTDIUSBSerialDriver**.
5. In your **Utilities** folder, open the **Terminal** program.
6. At the prompt, type: **`cd /Library/StartupItems/FTDIReEnumerate`** and press **RETURN**.
7. Type **`sudo pico FTDIReEnumerate`** and press **RETURN**.
8. Type in your administrator password when requested by the system.
9. Find this line in the terminal editor window:
   `/Library/StartupItems/FTDIReEnumerate/ReEnumerate –v0403 –p6001`
10. Replace it with these two lines:
    `/Library/StartupItems/FTDIReEnumerate/ReEnumerate –v0403 –pEE18`
    `/Library/StartupItems/FTDIReEnumerate/ReEnumerate –v0403 –pDA38`
11. Save the file.
12. Exit the editor.
13. Exit **Terminal**.
14. Restart the Macintosh.
    - When you open FlightView you will see the available serial port installed by the USB driver.

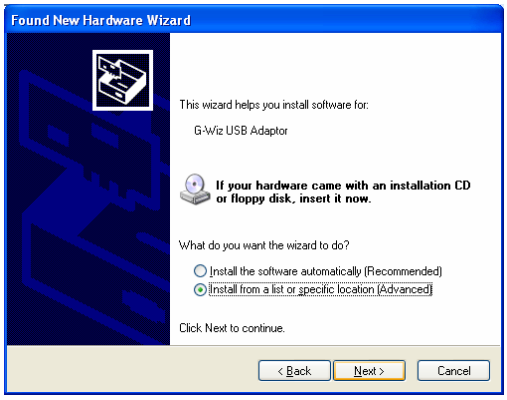
Your computer is now ready to connect to your G-Wiz HCX flight computer through the G-Wiz USB Interface Card

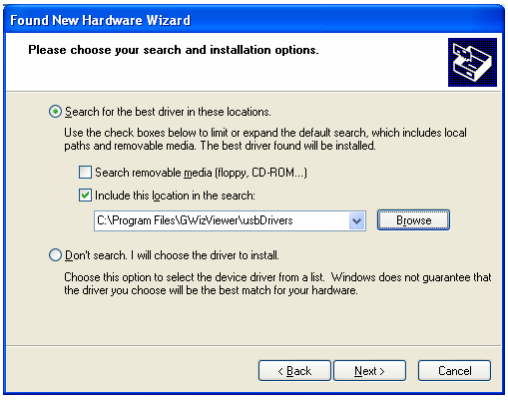
Appendix F

Installing USB Drivers on XP

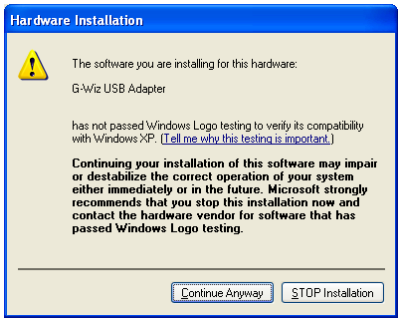
Because installing our drivers on Windows XP is more complex than on the older Windows operating systems, here is a guided tour.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel


Found New Hardware Wizard
This wizard helps you install software for:
G-Wiz USB Adaptor
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
C:\Program Files\GWizViewer\usbDrivers
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

1. Log into your PC as an administrator before attaching the interface card to your PC for the first time.
2. Install FlightView.
3. Attach the USB interface card to your PC.
   - Windows XP will display the **Found New Hardware** dialog box.
4. Select **No**, not this time, and click **Next**.
   - Windows XP will now ask where to find drivers.
5. Select **Install from a list or specific location (Advanced)**, and click **Next**.
   - Windows will now display the **Please choose your search and installation options** dialog box.
6. Select the **Search for the best driver in these locations** option.
7. De-select the **Search removable media** checkbox.
8. Click the **Include this location in the search checkbox**.
9. In the edit field, navigate to the directory where you installed FlightView, and then to the **usbDrivers** directory under it.
   - The location shown here is the default installation directory, if you installed FlightView at C:\Program Files.
10. Click **Next**.
    - Windows XP will display the **Hardware Installation** dialog box


Hardware Installation
The software you are installing for this hardware:
G-Wiz USB Adapter
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

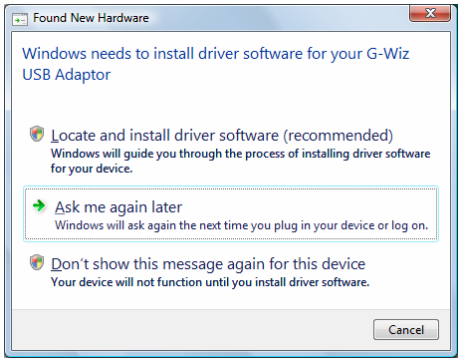
11. Press the **Continue Anyway** button.
12. Repeat steps 3 through 11 for the second driver.
13. Start FlightView and look for the most recently installed **COM** port.
14. Select it.

Your computer is now ready to connect to your G-Wiz HCX flight computer through the G-Wiz USB Interface Card.

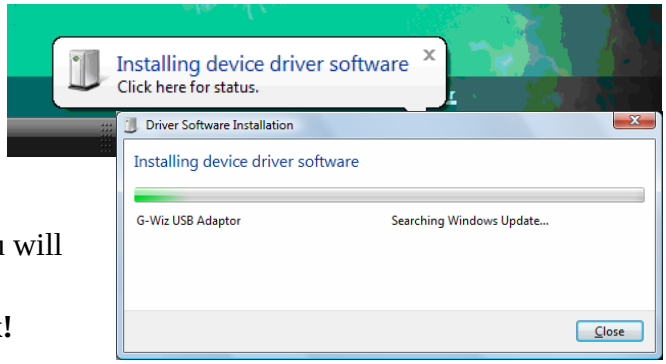
Appendix G

Installing USB Drivers on Vista

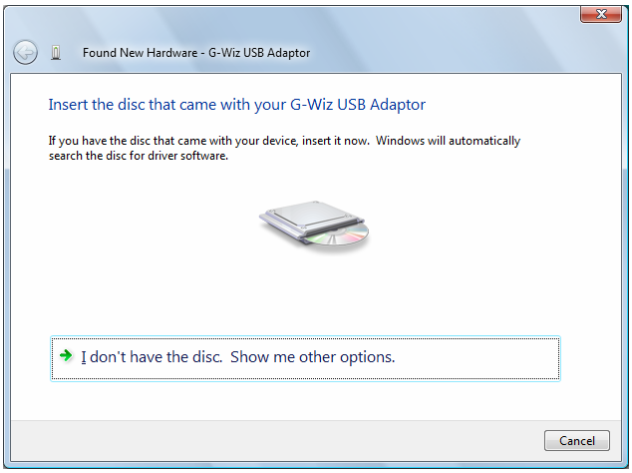
When you install our drivers, Windows Vista has an even more complex process than XP. Mainly this is because Microsoft is trying to make the process totally invisible to the user. Therefore, if you have anything unusual about an installation, Windows gets confused. This is a step by step tour of the process.


Found New Hardware
Windows needs to install driver software for your G-Wiz USB Adaptor
Locate and install driver software (recommended)
Windows will guide you through the process of installing driver software for your device.
Ask me again later
Windows will ask again the next time you plug in your device or log on.
Don't show this message again for this device
Your device will not function until you install driver software.
Cancel

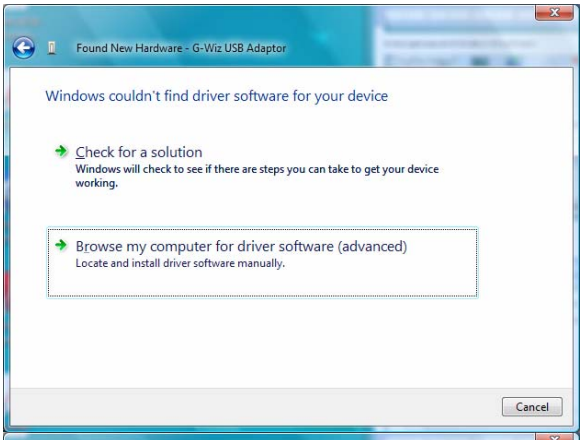
1. Log into your PC as an Administrator before attaching the interface card for the first time.
2. Attach your USB interface card and cable to your PC.
   - Windows Vista will display the **Found New Hardware** dialog box.
3. Select **Locate and install driver software**.
   - If you select **Ask me again later**, the installation will stop. To restart the installation process, unplug the USB card and then plug it back in.
   - Windows will start by looking for drivers in **Windows Update**. There is no way to tell Windows not to do so. If you click on the **Device Installation** icon in the notification area of the taskbar you will see the progress dialog box.



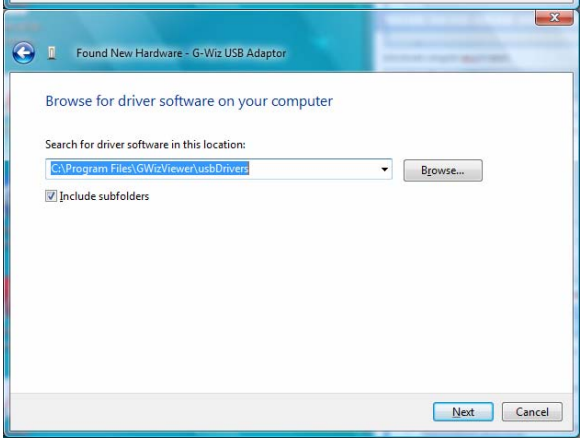
4. **Do not close the Progress dialog box!**
   - After searching for a few minutes, Windows will ask you for a CD containing the drivers.
5. Click **I don't have the disc**. Show me other options.
   - Windows will ask where to look for the drivers


Found New Hardware - G-Wiz USB Adaptor
Insert the disc that came with your G-Wiz USB Adaptor
If you have the disc that came with your device, insert it now. Windows will automatically search the disc for driver software.
I don't have the disc. Show me other options.
Cancel

6. Click **Browse my computer for driver software (advanced).**
   - Windows opens a **Browse for** dialog box.

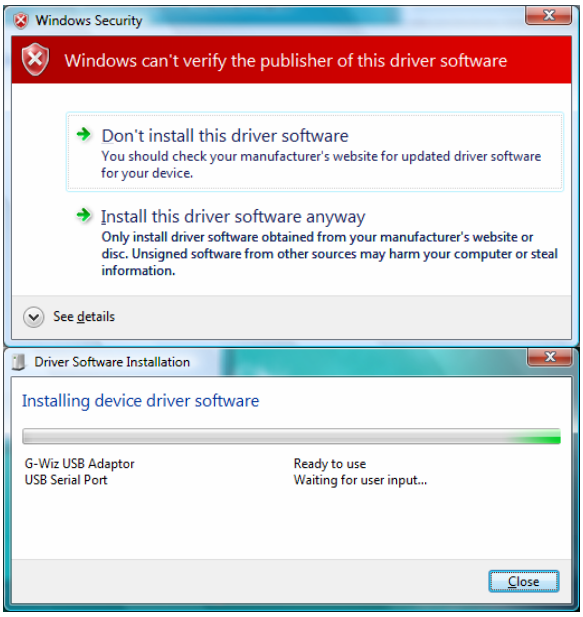

Found New Hardware - G-Wiz USB Adaptor
Windows couldn't find driver software for your device
Check for a solution
Windows will check to see if there are steps you can take to get your device working.
Browse my computer for driver software (advanced)
Locate and install driver software manually.
Cancel

7. Navigate to the directory where you installed FlightView.
8. Select the **usbDrivers** directory.
9. Click **Next**.
   - Windows Vista will start to install the drivers.
   - Windows will display a **Windows Security** dialog box.



10. Click **Install this driver software anyway**.
    - When Windows tells you it has finished installing the drivers for the G-Wiz USB Interface Card, it will tell you it has found a second device that needs a driver.

11. Repeat steps 3 to 10 for the second driver.
12. Start FlightView and look for the most recently installed **COM** port.
13. Select it.


Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details
Driver Software Installation
Installing device driver software
G-Wiz USB Adaptor
USB Serial Port
Ready to use
Waiting for user input...
Close

Your computer is now ready to connect to your G-Wiz HCX flight computer through the G-Wiz USB Interface Card

List of Procedures

To Set Up the On-Board Hardware 7
To Attach Devices to the Terminal Blocks 7
To Test the Setup 8
To Change Configuration Settings 8
To Enable the Flight Computer for High Current Use 11
To Enable the Flight Computer for Low Current Use 11
To Enable the Flight Computer for Cluster Ignition 11
To Enable the Flight Computer for Staged Ignition 11
To Enable the Flight Computer for a Breakwire Launch 12
To Enable the Flight Computer to Accept Analog Input 12
To Attach Power Wires If You are Using a Single Battery 13
To Attach Power Wires If You are Using Two Batteries 13
To Set Up the External Safety Shunt 14
To Set Up for a Breakwire Launch 14
To Attach a User-Provided Sensor on the BreakWire/Analog Inputs 15
To Correct the Setup, If You Want a Breakwire Flight 16
To Correct the Setup, If the Breakwire Mode was Configured by Mistake 16
To Set the FlightView Program Preferences 20
To Read Your Flight Data from the Mini-SD Card 23
To Read a Previously Saved Flight Data File 23
To Save your Data Files 27
To Install the G-Wiz USB Interface Drivers 28
To Connect with the G-Wiz USB Interface Card after Your Drivers have been Installed 29
To Connect with the G-Wiz RS-232 Serial Interface Card 29
To Disconnect your HCX Flight Computer 31
To Configure the Flight Computer 32
To Use the Test Flight Feature 37
To Update your Firmware 39
To Configure the Breakwire/Analog Port in FlightView 41
To Configure the Breakwire/Analog Port and the FlexPort in FlightView 42
To Set Up the Flight Computer for User Data Input 42
To Test your Sensor 42
To Download and Scale your Flight Data 43
To Install the USB Drivers on a Macintosh 10.2 and Earlier 53

If, after reading this manual, you have any questions or problems with either your flight computer or the FlightView software, please visit us on the web at: http://www.gwiz-partners.com. We maintain an FAQ on our web site. In addition, the latest versions of both FlightView and the HCX Firmware are posted there for download.

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